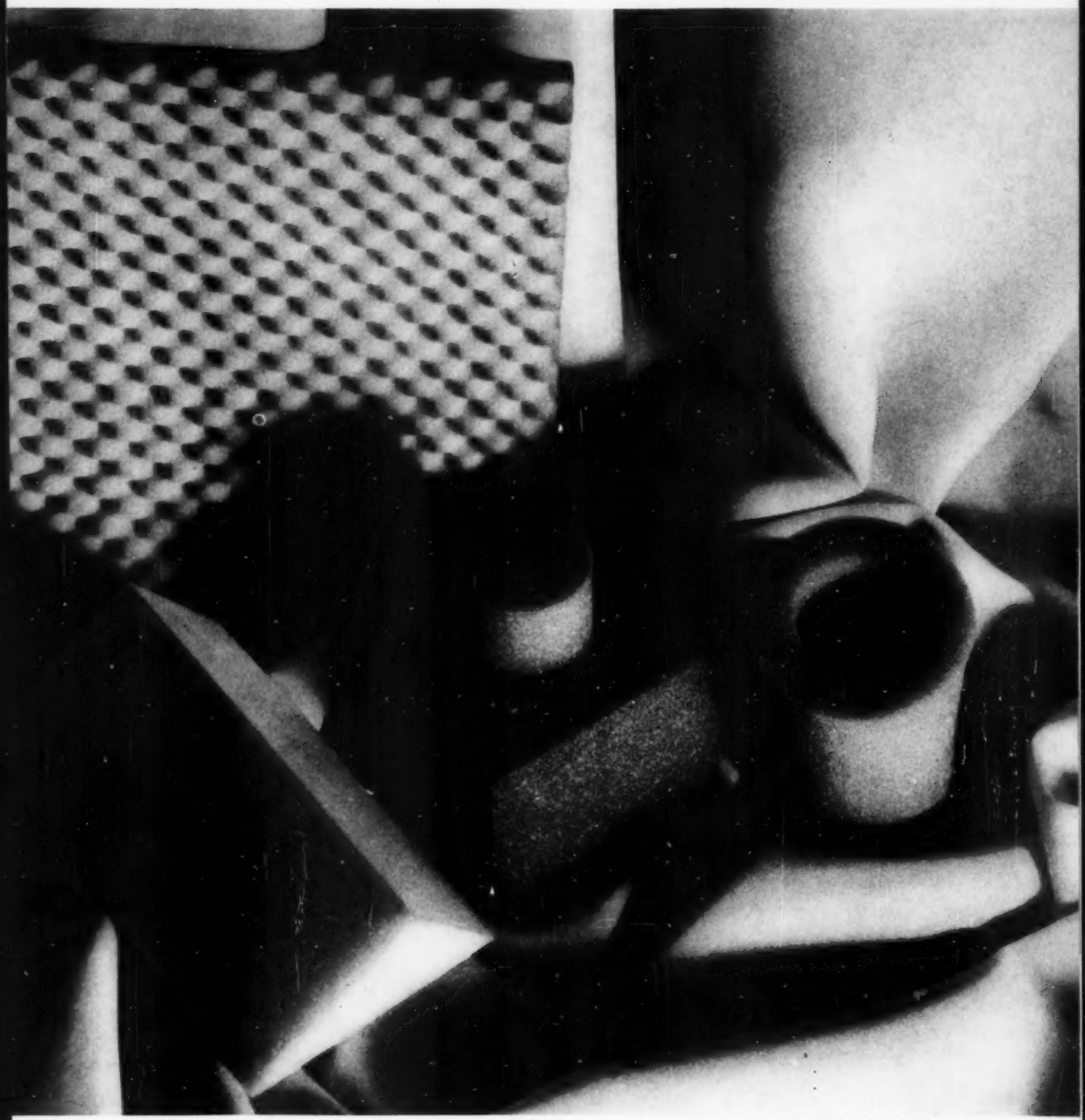
MODERN PLASTICS

MARCH 1959



PHOTOGRAPHED FOR MODERN PLASTICS BY EDITH PAUL MARSHALL

COSTS SLICED—NOT SEATS!

Vandals used to carve a $100,000-a-year slice out of a big city's transit budget.

Switchblade artists literally ripped the stuffings out of upholstered bus seats. When the hoodlums rested, daily wear and tear kept on working. Seams gaped, springs popped, cover material cracked.

Then the city transit authorities ordered 330 new buses with glass-reinforced plastic seats like the ones you see here. Made with tough, fire-retardant Hetron® polyester, these seats can't be slashed, defy damage. There are no seams, no springs, no cover materials to cause trouble.

Even including the cost of metal dies, these seats cost less to make than upholstered seats. *And the passengers like them better* —voted overwhelmingly in favor of them in rider reaction tests. Transit officials plan to replace *all* the city's buses with vehicles featuring these vandalproof seats.

Retards fire

Where can *you* save money—or make money—with strong reinforced-plastic shapes that retard fire? There's a whole family of Hetron resins to help you. Hetron is *inherently* self-extinguishing —gives you fire retardance with no loss of mechanical strength. Heat resistance, moisture resistance, electrical properties of Hetron laminates and premix-molded shapes are outstanding.

To get a better idea of what you can do with these versatile resins, write now for the complete Hetron data file.

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MATCH-METAL-MOLDED SEAT employs ten pounds of Hetron in ratio of 45% resin, 25% glass, and 30% filler.

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Doubly Desirable... HEAT RESISTANT – HIGH IMPACT Catalin STYRENE

The new luxury Dualette TV set by Sylvania* is designed to serve a double purpose . . . as a lightweight dual-speaker portable . . . and as a chic table model, handsome on all sides, even the back. Therefore the plastic for the cabinet, molded in two sections, had to meet twin requirements . . . feather-light toughness for portability . . . lustrous beauty of hue and of surface, in three charming color combinations to blend with room decor when seen from any direction. Sylvania's choice of molding compound for the cabinet was an obvious one . . . heat resistant, high impact CATALIN STYRENE.

The desirability of CATALIN STYRENE—*the gem of plastics*—is dual in another sense, too, for its value to molders and manufacturers is twofold: first, Catalin offers the widest range of formulations, with the very highest standards of quality . . . and, secondly, Catalin — through its strategically located facilities in the East, Midwest and South, linked in a sales-office-to-warehouse teletype network — routes orders to molders with on-the-dot scheduling. This double assurance of basic-material satisfaction is yours when you specify Catalin Styrene, Polyethylene and Nylon molding compounds. Inquiries invited.

**Dualette is custom molded for Sylvania Home Electronics, a division of Sylvania Electric Products, Inc., Batavia, N. Y., by Buffalo Molded Plastics, Inc. of New York and Buffalo Molded Plastics, Inc. of Pennsylvania.*

Catalin Corporation of America Catalin **One Park Avenue, New York 16, N. Y.**

MODERN*

• THE PLASTISCOPE

U. S. Steel enters the plastisol-coated market (p. 41); What's behind the styrene price situation? (p. 194); Du Pont reduces price from 8 to 10% on all grades of Teflon TFE-fluorocarbon resins (p. 206); Cincinnati Industries introduces formable paper-plastic laminates that stretch up to 60 percent (p. 204).

• EDITORIAL

Here are three suggestions to cope with the intolerable volume of technical conference literature.

• GENERAL

These ubiquitous foams are now available in a practically unlimited range of densities, properties and shapes, at prices competitive with or lower than long established materials. Whether your interest is in furniture, transportation, building construction, packaging, clothing or what not, you can't afford to miss this article. It brings you up to date on the latest in flexible urethane foams, spells out the new use possibilities.

One of G-E's ordnance plants needed a checking gage in a hurry. The best they could get was three week's delivery and a price of $60. How they cut this price down to $2.50 apiece and delivery time to eight hours is told in this article. *By D. M. Drummond.*

Supply cores for rolled coated stock represent a major expense in many industries. Here is a case history of how one major company managed to cut this expense in half. . . and get a better product in the bargain. Involved are molded polyethylene sections joined together on an ingenious heat-sealing machine.

Cutting or eliminating on-site labor has been one of the most cherished dreams of the construction industry. Reason: factory-produced modular components can speed up turnover—and increase profits phenomenally. Now comes a demonstration house that brings this dream close to reality. Erected in a single day with studless foam-core modular panels, the building exceeds Federal Housing Authority specifications. This article tells the full story.

Of vital interest to all companies in sheet thermoforming is Hotpoint's new automated facility to make refrigerator inner door liners. Capable of tremendous output, the production line incorporates the latest advances in industrial efficiency Here is a complete description of the facility, what machinery is used, how it is arranged, what it does, and why it was chosen. A detailed floor plan is provided to show the exact layout of the operation.

They are made by going to high-density polyethylene, impact styrene, phenolic, and vinyl metal laminates for major structural components. Gains: lighter weight, better design—and more sales. Three big brands have made the switch from metal. Their success points up a lesson to all those interested in the production of housings, optical equipment, and electrical gear. This article tells why the different materials were chosen, points out the advantages.

Three new agricultural uses of polyethylene and vinyl film promise more profits for the farmer. In one case, they help increase hog weight on less feed; in another, they let the small livestock producer purchase fodder economically in small quantities; in a third, they reduce lake weeding maintenance cost. The cost picture is spelled out

When the U. S. Navy went in search of a mine location marker that was of extreme ruggedness yet light in weight, it found the answer in styrene foam cores shrouded in reinforced epoxy skins. How these markers were made and the technique applied to other uses is told.

Built around styrene-acrylonitrile and polyethylene parts, this sprayer challenges the supremacy of the aerosol spray in many product areas. How?

Modern Plastics issued monthly, except September when issued semi-monthly, by Breskin Publications, Inc. and Plastics Catalogue Corp., at Emmett St., Bristol, Conn. Second-class postage paid at Bristol, Conn. Subscription rates (including Modern Plastics Encyclopedia Issue), payable in U. S. currency: In United States, its possessions, and Canada 1 year $7, 2 years $12, 3 years $17; all other countries, 1 year $25, 2 years $45, 3 years $60. Single copies 75¢ each (Show issue, $1.00; Encyclopedia issue, $3.00) in the U. S., its possessions, and Canada; all other countries $2.50 (Show issue, $3.00; Encyclopedia issue $6.00). *Reg. U.S. Pat. Off

PLASTICS*

MARCH 1959
Volume 36 Number 7

It significantly reduces the cost of the end product. While not intended for cosmetic use, the sprayer produces a very fine mist and should find considerable markets in insecticides, cleaning sprays, odorants, and the like.

• ENGINEERING

• TECHNICAL

• DEPARTMENTS

Coming up

A high percentage of molded plastics are now decorated and a big variety of methods are used. Our April lead will offer a wide coverage of new techniques in decorating. . . The second article in our urethane series, concluding the foam portion, will be an April feature. . . Engineering Section in April will present two tests for premix curing behavior and flow behavior. . . Also an authoritative article on polycarbonate processing. . . May issue lead will be a roundup of all available information on the exciting subject of spray guns for reinforced plastics processing and methods of using them. . . The third of the series of articles on urethanes will run in May. . . Also a discussion of a new formable paper laminate with plastic skin. . . Technical Section in May will have an article on isophthalic polyesters. June lead will be a presentation of methods of manufacturing large polyethylene containers. . . July lead will be the first of a series on the fast-growing epoxies.

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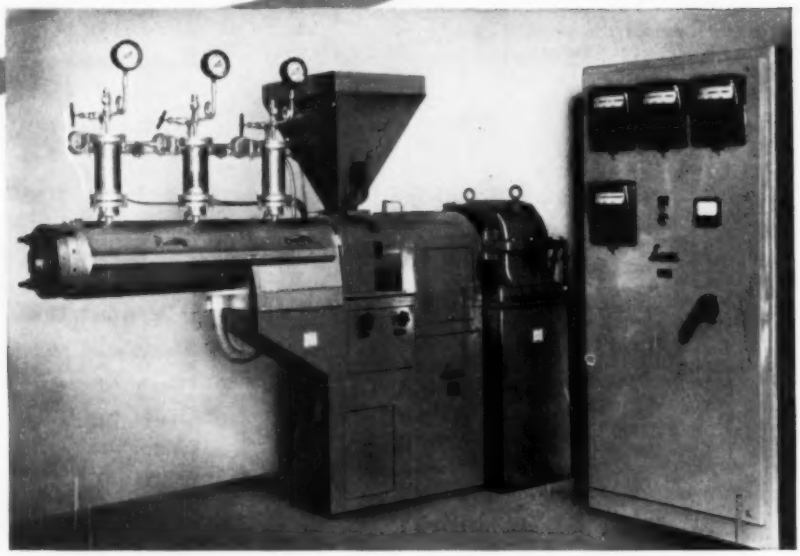

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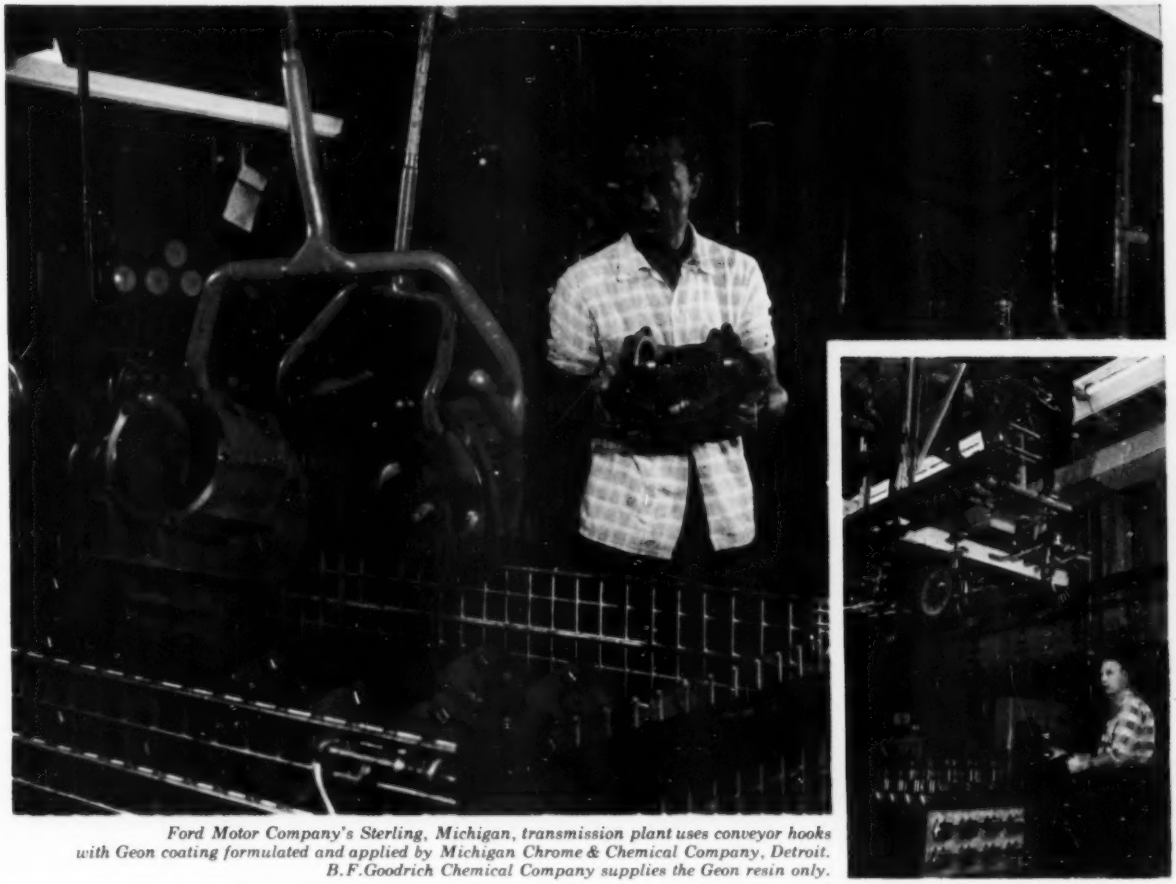

Ford Motor Company's Sterling, Michigan, transmission plant uses conveyor hooks with Geon coating formulated and applied by Michigan Chrome & Chemical Company, Detroit. B.F.Goodrich Chemical Company supplies the Geon resin only.

"Soft touch" of Geon safeguards parts quality

The overhead conveyor system in this automatic transmission plant uses 26,000 hooks coated with Geon polyvinyl material. The soft yet durable coating made from Geon protects finished parts while they are carried from machining to assembly stations.

In addition to giving the hooks a long and profitable service life, the Geon coatings come in any color, permitting color-coding for multiple conveyor operations.

Versatile Geon is ideal for many coating applications, since it disperses readily in the coating formula. Geon can be used to coat paper, textiles, metals or almost any material to provide new or improved advantages. Hundreds of types of Geon resins, plastics, latices and polyblends are available, tailored to specific uses for coatings, moldings, extrusions, or rigid or foam applications. For information, write Dept. AF-1, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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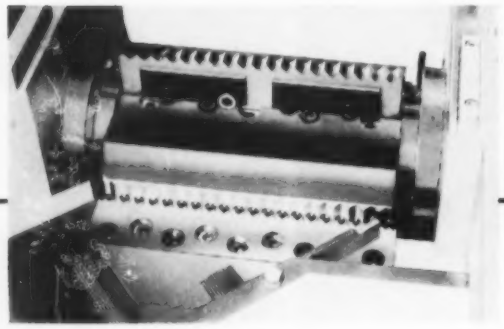

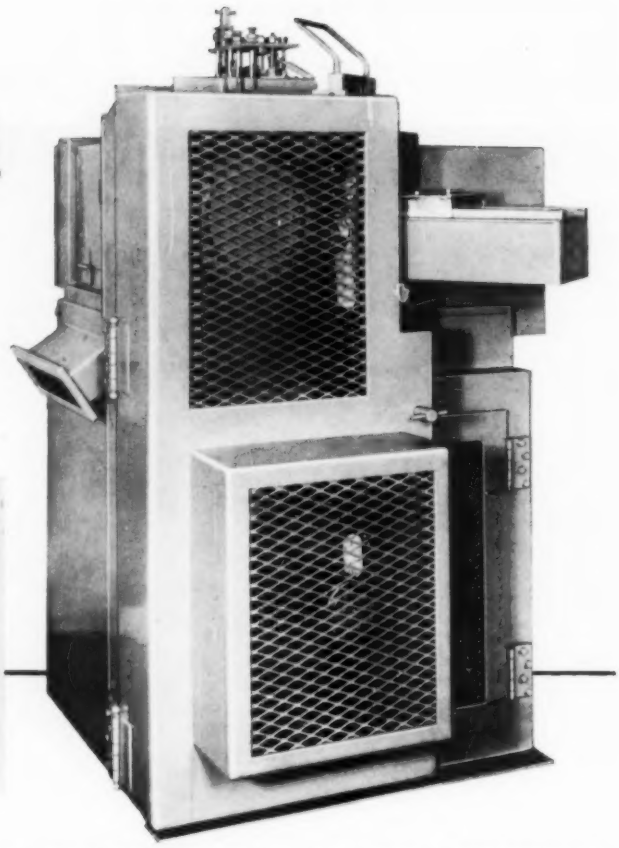

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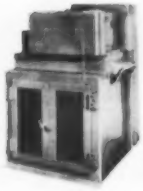

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Elongation (%)	D638-52T	48—63
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Flexural strength (p.s.i. at break)	D790-49T	3300—10700
Rockwell hardness: (R scale)	D785-51	−15 to 106
Izod impact: (ft. lb./in. notch)	D256-43T	1.2—11.0
Heat distortion: (°C.)	D648-45T	51—70
Water absorption:		
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% moisture gain	D570-42	1.5—1.8
% water absorption	D570-42	1.6—2.0

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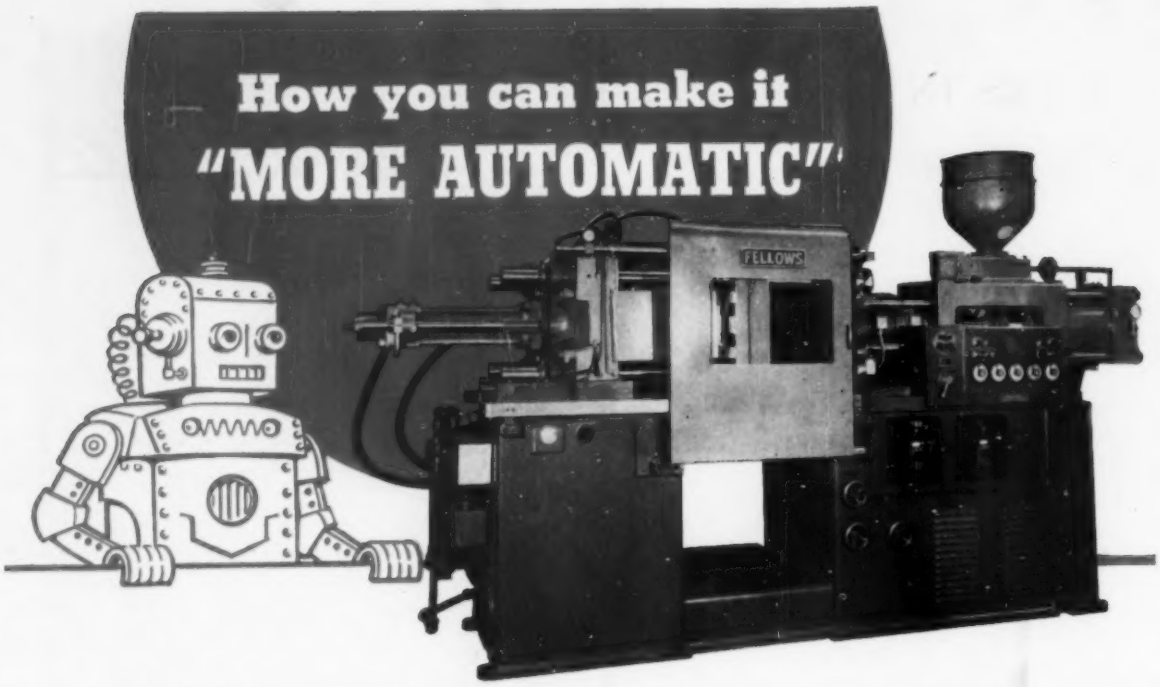

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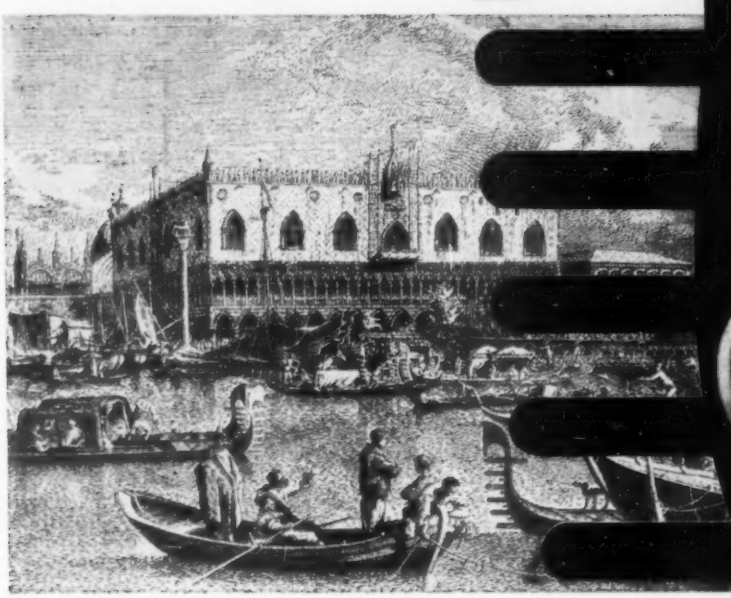

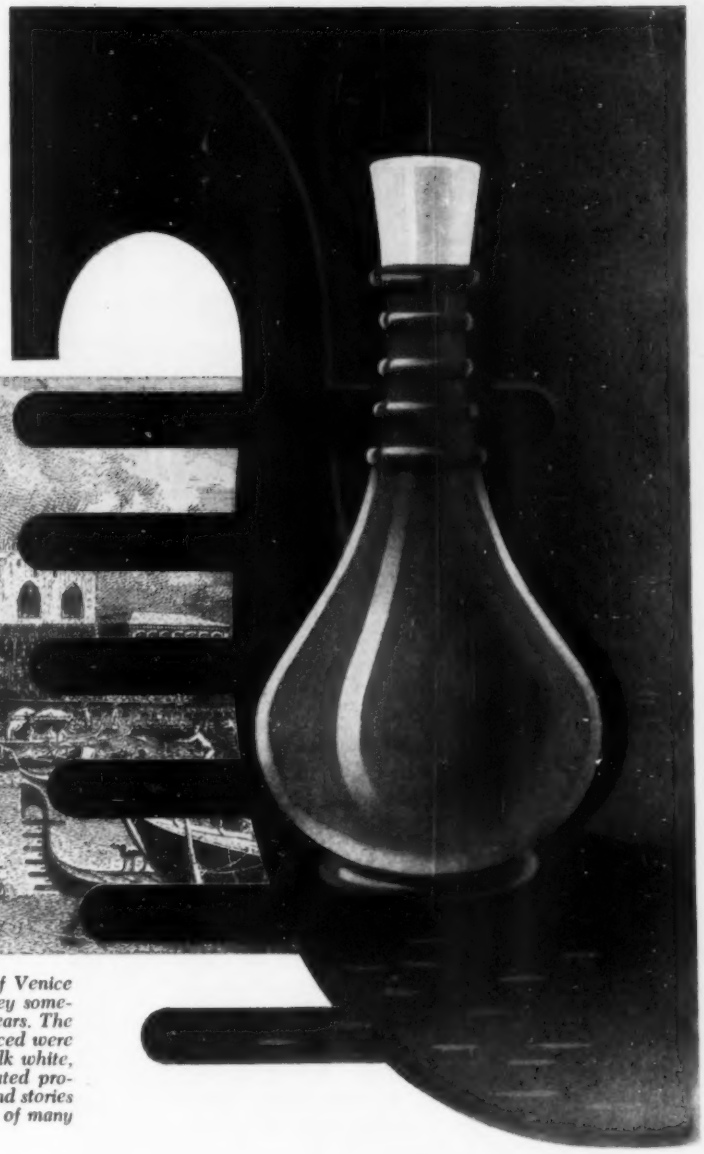

Four hundred years ago, the glass blowers of Venice reached the climax of their art . . . which they sometimes equalled but never surpassed in later years. The graceful and airy vessels the Venetians produced were frequently made of glass that was colored milk white, blue, violet or green. Some craftsmen illustrated processions, love scenes, portraits, coats-of-arms and stories by painting directly on the glass with enamels of many colors.

Whether we are looking at the refined art of Venice or reproductions of primitive cave drawings . . . we can see that our own ideas of form and color have developed from the successive legacies of older cultures. Today, beauty and color in plastics reflect a special sense of 20th century aesthetics . . . and a special knowledge of 20th century color technology. For the past 12 years WESTCHESTER PLASTICS has pioneered the use of color in plastics . . . successfully matching and creating over 4000 different shades and colors . . . with color concentrates and pre-mixed color blends of conventional and linear polyethylenes and other thermoplastics.

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Photo courtesy Capitol Records, Inc., Hollywood, Calif.

Sound Answer to a Record-Making Challenge

The rising tide of interest in stereophonic sound has record companies rushing to meet demand. But high-speed pressing of stereo presents a real challenge for the record maker.

Here's why: The needle, or stylus, moves both laterally *and* vertically in the grooves of a stereophonic record. With regular hi-fi, the stylus moves *only* from side to side. This means the grooves of a stereo record must be strong enough to do *twice* the work of standard high-fidelity grooves. Yet (*and this is vital*) quality of tone must not be impaired.

One major record company has answered this challenge with PLIOVIC, Goodyear vinyl resin. Not only does PLIOVIC toughen the grooves, it has improved compound flow during pressing–reduced flash, lowered rejects and made possible more efficient, more economical production. Most important of all–it has enhanced the illusion of "living sound."

Want to improve the quality–and sales appeal–of *your* product? PLIOVIC may well be the answer. For more information–plus latest *Tech Book Bulletins* – write Goodyear, Chemical Division, Dept. C-9422, Akron 16, Ohio.

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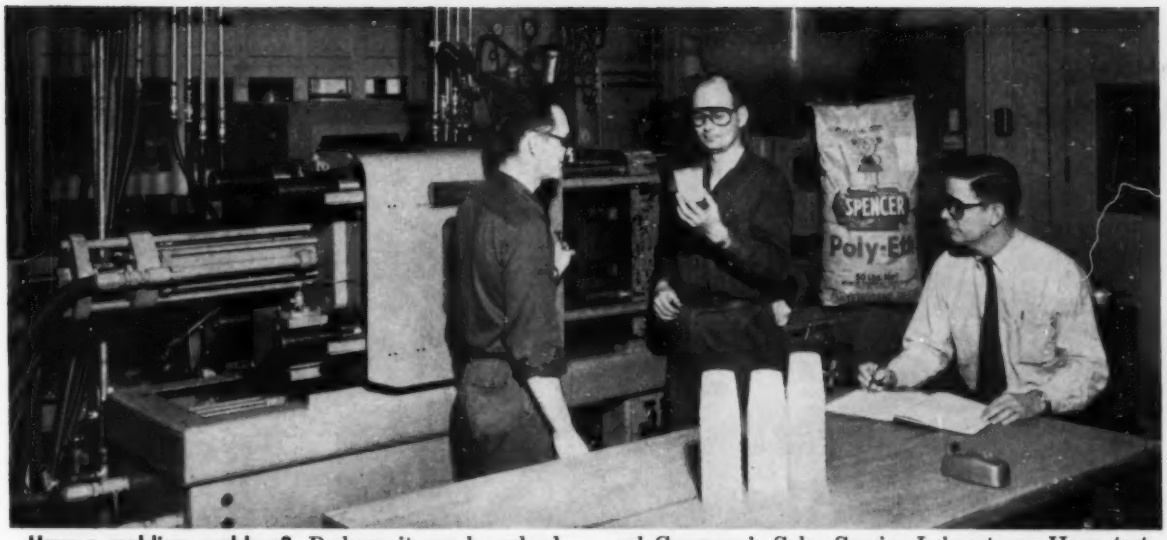


Have a molding problem? Perhaps it can be solved by the molding experts like these at Spencer Chemical Company's Sales Service Laboratory. Here, test cups are being run in a 4-ounce mold.

See How These 7 "Poly-Eth" Resins Can Meet Your Molding Requirements . . .

"Poly-Eth"	Melt Index	Density (g/cc)	Characteristics	Applications
1005	2	.917	NORMAL FLOW, EXCELLENT STRESS CRACK RESISTANCE.	HOUSEWARES, GENERAL PURPOSE MOLDING AND SHAPE EXTRUSION.
1007	8	.916	GOOD FLOW AND STRESS CRACK RESISTANCE, DECREASED MOLDING CYCLES.	HOUSEWARES, GENERAL PURPOSE MOLDING AND SHAPE EXTRUSION.
1008.5	22	.916	EXCELLENT FLOW, SUPERIOR SURFACE FINISH, EXCELLENT FLEXIBILITY.	HOUSEWARES, TOYS, SHAPE EXTRUSION.
1009	50	.916	SUPERIOR FLOW, EXCELLENT FLEXIBILITY.	TOYS, ULTRA-THIN SECTIONS, OTHER DIFFICULT MOLDINGS, SHAPE EXTRUSIONS.
1407	8	.925	GOOD FLOW AND SURFACE FINISH, EXCELLENT STIFFNESS.	HOUSEWARES, TOYS, SHAPE EXTRUSION.
1408.5	22	.925	EXCELLENT FLOW AND SURFACE GLOSS, SHORT MOLDING CYCLE.	HOUSEWARES, TOYS, SHAPE EXTRUSION.
1709	35	.928	SUPERIOR STIFFNESS, FLOW AND SURFACE GLOSS, IMPROVED ABRASION RESISTANCE.	HOUSEWARES, TOYS, DIFFICULT MOLDINGS, SHAPE EXTRUSIONS.

Poly-Eth by SPENCER

. . . and how the Spencer Sales Service Lab can help solve your molding problems:

No matter what you mold, or how you mold it, Spencer Chemical Company has a polyethylene resin to meet your strictest requirements. Ranging in density from .916 to .928, these seven "Poly-Eth" resins are especially designed for molding applications.

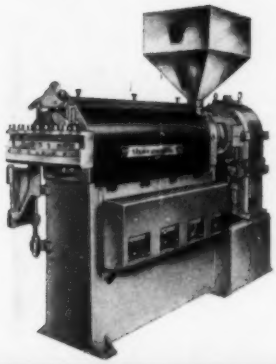
Tested in Spencer's own lab and proven in full-scale molding operations, this family of Spencer resins offers you a wide scope of properties for housewares, toys and general purpose molding. And . . .

To help solve your molding problems or to provide you with market development information, Spencer's Sales Service Laboratory is ready to assist you. Staffed with experienced molding specialists, this lab is equipped for testing resins, molds and end products. You can take advantage of this service by contacting your Spencer sales representative through the Spencer District Office nearest you.

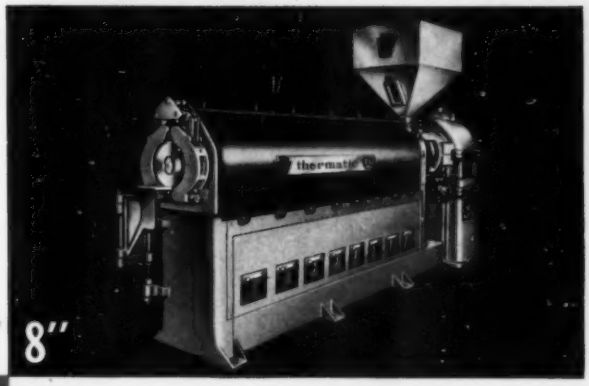
SPENCER DISTRICT OFFICES:
Kansas City—Dwight Building
New York City—500 Fifth Ave.
Chicago—1st National Bank Bldg.
Los Angeles—1435 S. La Cienega

SIZE for SIZE

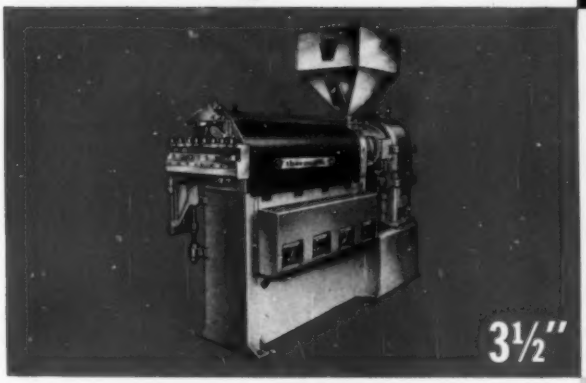
A New thermatic Series* extruder will outproduce any extruder on the market



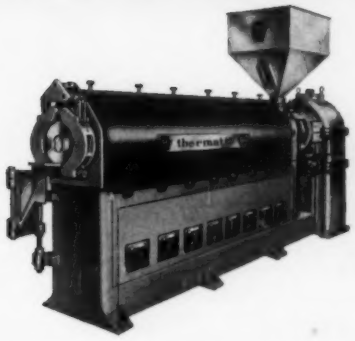
4½"



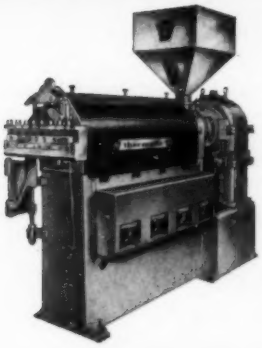
8"



3½"



6"



2½"

	2½"	3½"	4½"	6"	8"
More Horsepower Capacity	84	107	142	209	308
Higher Screw Speeds	200	150	110	85	60
Greater Output (lbs./hr.)*	200	375	600	900	1500

*PE (20,000 mol. wt., 4.0 melt index, 0.92 sp. gr., 500°F., 3000 p.s.i)

*Patented

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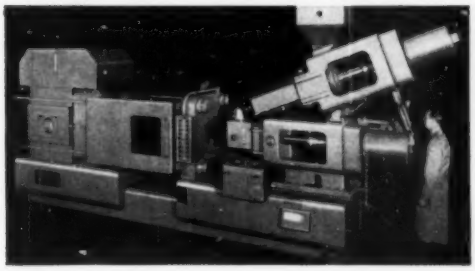
HPM PREPLASTICIZER

Extremely Fast... Exceptionally High Injection Rate... Each Shot Exact In Weight

After being rigorously tested for many months in actual plant operation, these new, fast H-P-M preplasticizing injection machines came up to our every expectation. One machine speeded up large parts production for its owner by over 100% . . . the molding superintendent says "it's the machine of the future." Absolute shot size control is accomplished by the combination operation of a rotary material control valve and an adjustable nut for accurately measuring each shot of material. Let us tell you what these new machines will do for you. Call in a near-by H-P-M engineer or write for complete information today.



A COMPLETELY NEW CONCEPT IN PREPLASTICIZING

These machines are built in three sizes—450-ton—80 oz.; 800-ton—200 oz.; 1500-ton—300 oz. The 80 oz. and 200 oz. machines are illustrated above. They are ideal for filling deep, thin-walled sections or large areas that must be filled rapidly. Parts are better in quality and uniform in size and weight.

SPECIFICATIONS

MACHINE MODEL	Standard 450-P-80	Long Stroke 450-P-80	1000-P-200	1500-P-300
Material Injected Per Cycle (oz./max.)	80	80	200	300
Clamp Tonnage	450	450	1000	1500
Plasticizing Capacity (lbs. per hr.)	200	200	300	400
Mold Space (in. max.)	26½x36	26½x36	39x60	48x72
Daylight (in.)	40	54	65	106
Mold Thickness (min. without spacer-in.)	15	20	20	46
Stroke (in.)	25	34	45	60
Rate of Injection (cu. in./min.)	1530	1530	4050	6640
Horsepower	75	75	180	275

NOTE: Machines can be equipped for higher speed injection if desired.

H828

THE HYDRAULIC PRESS MFG. COMPANY

A DIVISION OF KOEHRING COMPANY • MOUNT GILEAD, OHIO, U. S. A.

UNIFORMITY

another profitable advantage of Bestwall Industrial Plasters.

To bring out the details of a relief map, the plaster mold must be uniform in its strength, set, and low expansion qualities. Bestwall Molding Plasters have long been used for such delicate jobs where sharp, clear, uniform results are a necessity.

Through careful controls in every step of production, all Bestwall Industrial Plasters have a constant uniformity . . . in the same bag, the same shipment, over a period of years. You can depend on it and profit by the time and cost-savings that result.

Bestwall makes a complete line of industrial plasters for the aircraft, automotive, pottery making, plastic forming, and plate glass manufacturing fields, among others. Special formulas can be developed to meet any specific need.

Whatever you need in industrial gypsum plasters, try Bestwall first. Your Bestwall representative will be happy to supply complete information.

YOUR BEST BUY IS INDUSTRIAL BESTWALL® BUILDING PRODUCTS

BESTWALL GYPSUM COMPANY • Ardmore, Pennsylvania • Plants and offices throughout the United States

hr

Industry usage* endorses

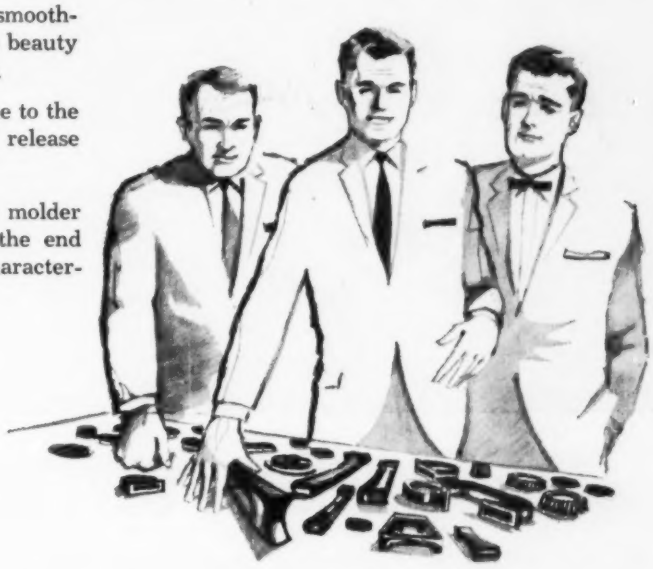
PLENCO HEAT RESISTING PHENOLIC COMPOUND 349

FOR APPLIANCE handles, knobs and trim that must have the highest possible heat resistance, molders recommend and leading manufacturers specify Plenco 349 HR. because:

- It possesses a heat resistant range up to 500°F.
- Offers superior surface finish, smoothness and lustre that adds to the beauty and saleability of the appliance.
- Provides efficient production due to the fast cure and excellent mold release characteristics of the material.
- Assures dependability: To the molder because of its uniformity—to the end user because of its molded characteristics.

*We estimate that (since its introduction in 1952) eighty to one-hundred million parts have been molded from Plenco 349 HR. . . . and for many of the best-known names in the appliance industry.

Investigate the good reputation of this excellent material; it will serve you well.



PLENCO PHENOLICS
FOR BETTER PLASTIC PRODUCTS

IF PHENOLICS CAN DO IT—

plenco

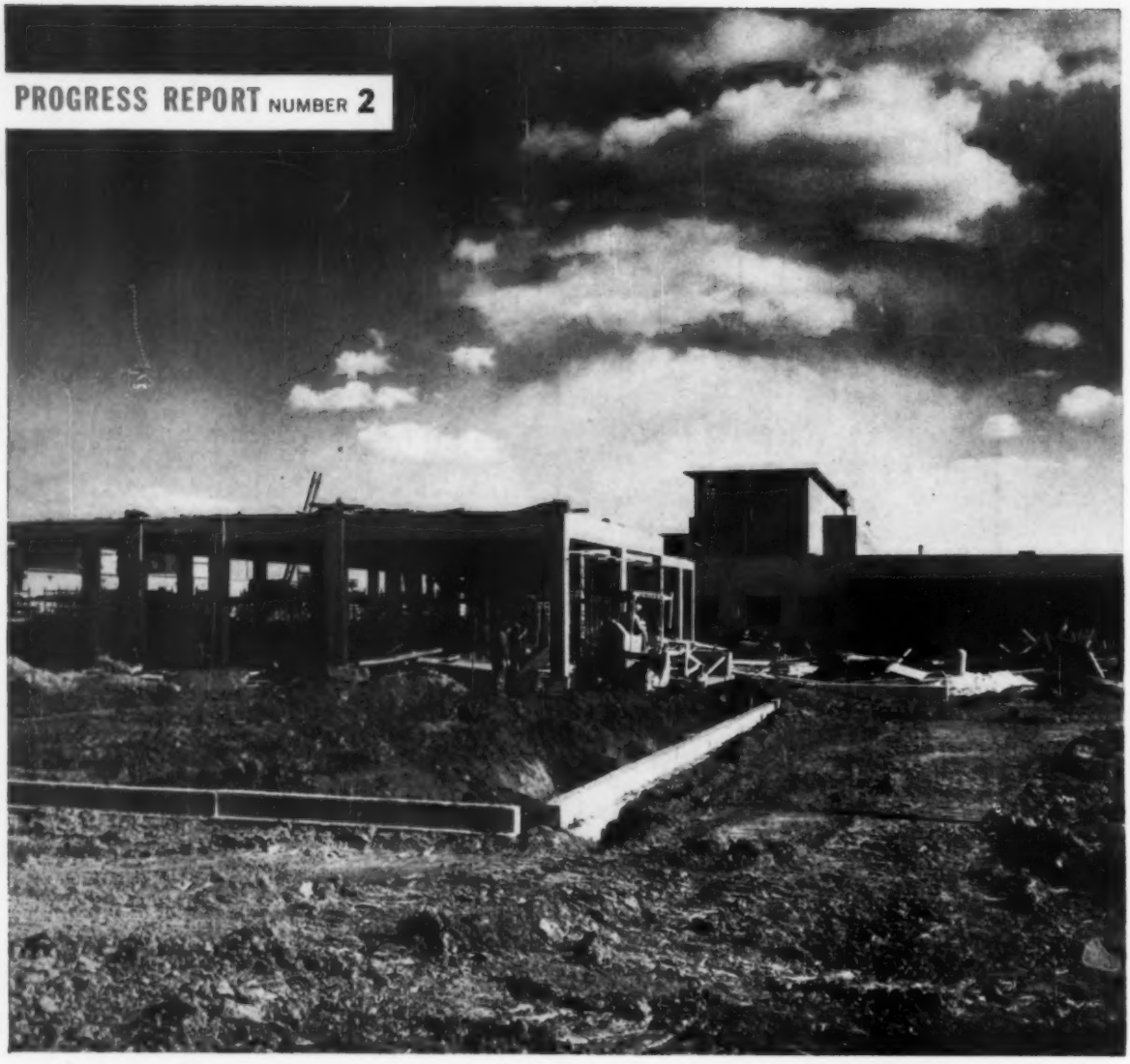
CAN PROVIDE IT...

already-made or specially-made

PLASTICS ENGINEERING COMPANY

Sheboygan, Wisconsin

Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins



ENJAY ADDING POLYPROPYLENE LAB

Customer technical service wing under construction!

This new polypropylene technical service wing at the Enjay labs in Linden, N.J., will be completed soon. It will be the most modern laboratory in America dedicated to helping the plastics industry to produce better products at low costs. It will be complete with prototypes of the equipment used by plastics manufacturers and staffed with scientists and technically trained men. The new polypropylene wing is another step in Enjay's expansion plans to better serve the plastics industry.

A new plant is also under construction to make polypropylene available by early 1960. This amazing plastic has already found varied product uses, and it is expected to open many industrial and consumer applications.

WATCH OUR PROGRESS REPORTS. They'll tell you all about this new product . . . and when samples will be ready.

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY COMPANY, INC.

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ENJAY

PLASTICS

Let's CUT COSTS

on these Secondary Operations

- DRILLING
- REAMING
- TAPPING
- TURNING
- MARKING
- PUNCHING
- GRINDING
- ROUTING
- SAWING
- THREADING

High cost second operations can kill first operation profits. If you perform any of the above secondary operations, better take a critical look at how you do it. There may be cost saving opportunities you've overlooked.

If any one of them involves hand feeding of parts or tools—hand clamping—or mechanical means of performing push, pull or lift motions—The Bellows Co. can save you money.

The Bellows Air Motor and the numerous Bellows packaged pneumatic work units can, in a few minutes, transform hand operated machines and machine tools into fast automatic or semi-automatic production units. They are inexpensive to buy—your own tool room can install them quickly.

Here's how to start—

Write for these two booklets. Bulletin ML-3 and BM-25 will give you a quick picture of what others are doing—of what you can do—in cutting second operation costs. Write Dept. MP359, The Bellows Co., Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd., Toronto, Ontario.

The Bellows Co.

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION

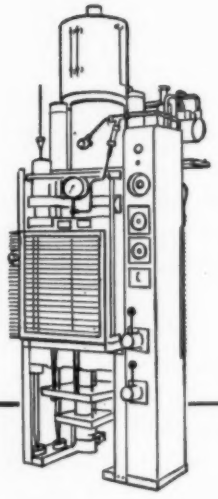
AKRON 9, OHIO

894-B

'He can't wait to see his new DANIELS press'

. . . it's a Transfer Press—easy to operate—high capacity. It's one of the comprehensive range of machines designed and manufactured by DANIELS LTD.

Moulding presses for rubber, natural and synthetic. Moulding and transfer presses for thermosetting plastics. Vacuum forming machines for thermoplastic sheet. Laboratory presses. Sheeting presses. Presses for densified woods. Injection machines for thermoplastics. Ram extruders for thermosetting plastics, P.T F.E., ceramics, etc. Pumping sets, hydraulic valves and fittings. Special machines.



DANIELS

Full technical advice always available.

Send for details of installation and maintenance services.

T. H. & J. DANIELS LTD · STROUD · GLOUCESTERSHIRE

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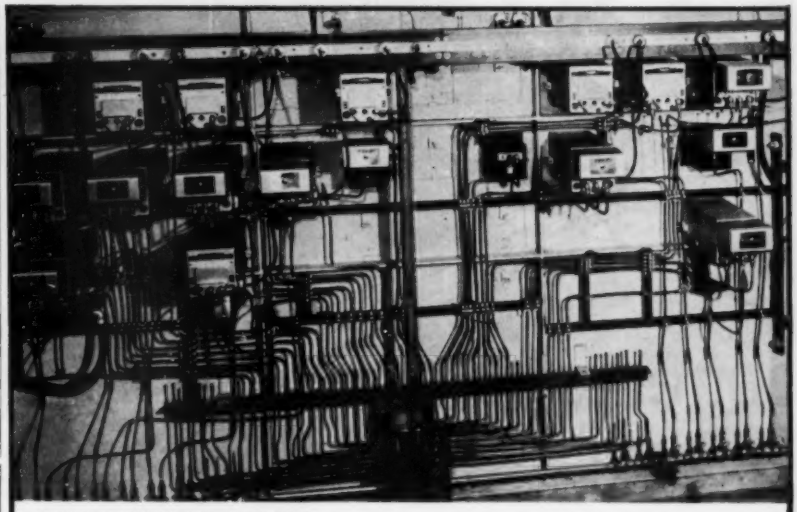
Plaskon Nylon News

A round-up of recent happenings in type-6 nylon, including new applications... and some economics for extruders to ponder.

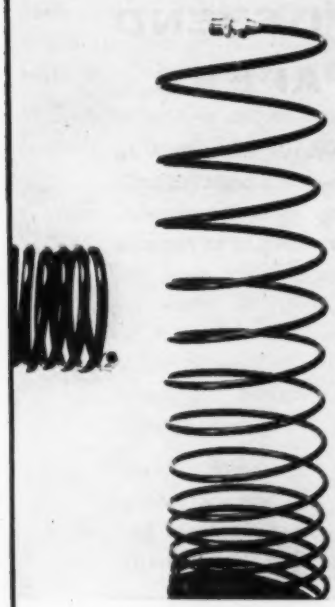
ECONOMY IN EXTRUSIONS

The question, "Is the scrap reusable?" can make or break the profit picture of any extruding operation. PLASKON Nylon Extrusion Compound 8205 maintains high-melt viscosity through successive regrinds. Scrap can be re-extruded several times without loss of basic properties. This scrap re-use often gives a sharp competitive advantage to users of PLASKON 8205.



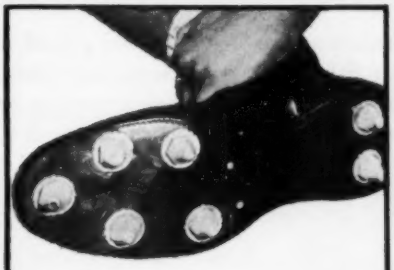
INSTRUMENTATION

Color-coded nylon tubing replaces copper in control panel at Allied Chemical's phthalonitrile plant, Edgewater, N. J. Nylon's advantages: 50% less in cost, greater corrosion resistance, easily color-coded.



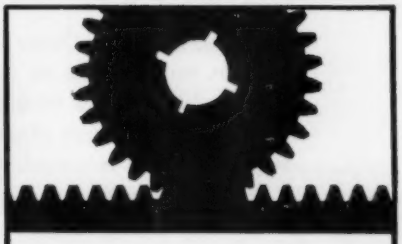
TOUGH AIR HOSE

For use with pneumatic tools, this lightweight "Nycoil" hose is extruded from PLASKON Nylon. It's tough, heat-resistant, unaffected by hydrocarbons . . . has permanent recoil action.



FOOTBALL CLEATS

Molded of PLASKON Nylon, these cleats outwear other types by a factor of 5 to 10. Their safety and durability suggest other possible applications in sports equipment.



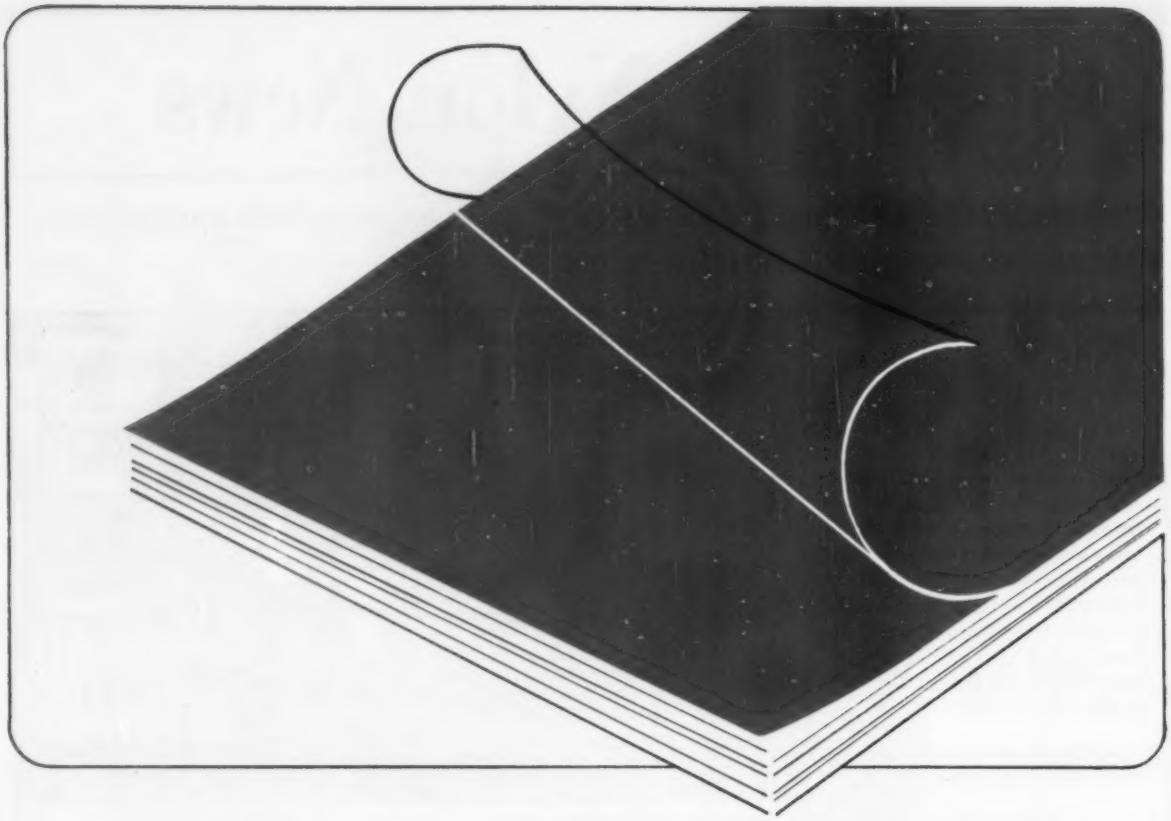
GEAR AND RACK

Type-6 nylon has higher impact resistance than other nylons. This advantage goes to work in a gear and rack molded of PLASKON Nylon and used in Scott Company lawnmowers. The parts are more durable than the metal ones they replace.

For further information, or technical assistance, write to our Nylon Product Development Department.

PLASTICS AND COAL CHEMICALS DIVISION
40 Rector Street, New York 6, N. Y

Allied Chemical



WHY LEADING LAMINATORS DEPEND ON WRENN SATURATING PAPERS

ONE good reason—a highly important one—is that we specialize in this field. The entire facilities of this modern paper mill, now in its second century of continuous operation, are devoted exclusively to the making of saturating paper and other absorbent specialities.

Another important reason is the extremely high standards we have set for the making of these products. Since the surface saturating paper—white or colored—is the layer which the user of the laminate sees, it is essential, especially with decorative applications, that it be absolutely clean and free from dirt particles.

Even a speck in the paper might show up as an irremovable blemish in a beautiful table top or counter surface. With this requirement, we go to extreme lengths in assuring the production of immaculately clean saturating paper. The beaters in which the pulp is refined are tile-lined. All air is filtered before entering the building in which the paper machine is housed. All water comes from deep wells and is multi-filtered.

There are other reasons why you may depend on the quality of Wrenn Saturating Papers. Let us tell you about them and show you samples. Your inquiry will receive prompt attention.

THE WRENN PAPER COMPANY

MIDDLETOWN, OHIO

Subsidiary of The Mead Corporation

we'll make the press

YOU NAME THE MATERIAL CHARACTERISTICS

Just tell us the nature of the material—polyester, acrylic, fiber glass, rubber, or whatever—and give us your production specifications. We'll build the right compression molding press to meet your needs.

Erie Foundry regularly builds hydraulic molding presses in capacities of 25 to 4,000 tons. Our advanced design control systems will apply forces accurately and precisely, maintain platen temperatures within close tolerances, and perform molding cycles with split-second timing. Versatility is built in so that a wide range of molding jobs can be handled.

Write now for your copies of our descriptive bulletins on Erie Foundry hydraulic presses for rubber and plastics.

Hydraulic Press Division
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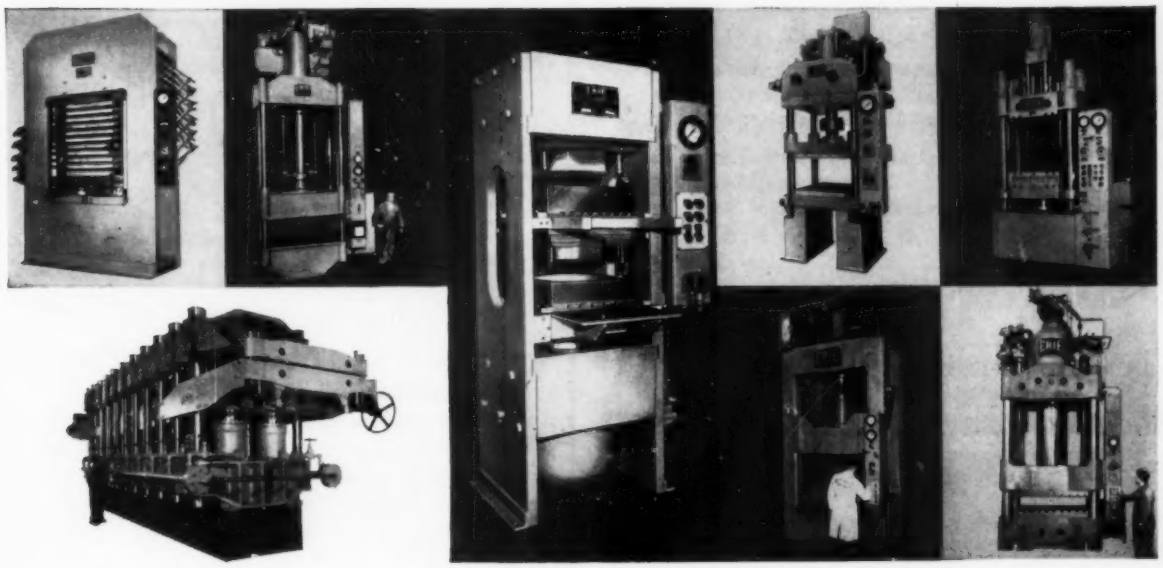
ERIE
THE GREATEST NAME IN FORGING . . . SINCE 1895



The new look in vinyl insulation...

3 "Dutch Boy" Lectro Stabilizers ready now for next year's wires

These new Lectro series stabilizers are "Dutch Boy" quality . . . made to the same high standards as such proven performers as "Dutch Boy" Tribase or Dutch Boy Dythal® Stabilizers.

Try the Lectro series in your new formulations. We'll be glad to help . . . with technical data and formulating suggestions. Just write.

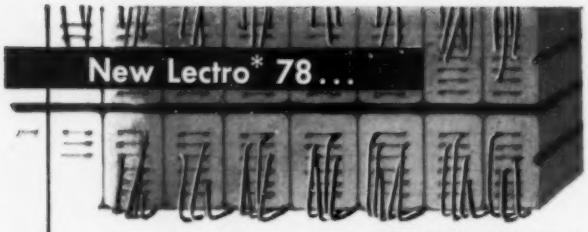
*Trademark

Dutch Boy® CHEMICALS

NATIONAL LEAD COMPANY
111 Broadway, New York 6, N.Y.

In Canada: CANADIAN TITANIUM PIGMENTS LIMITED
630 Dorchester Street, West, Montreal

New Lectro* 78...



105° and experimental higher rated wire

Stabilizer for severe heat service conditions

Lectro **78** is a new "Dutch Boy" lead stabilizer developed particularly for high temperature vinyl insulations. Tests indicate (1) it stabilizes against extreme processing temperatures without gassing; (2) it imparts exceptional heat service life.

Lectro **78** sets new highs for volume resistivity over a range of temperatures in tests made according to Underwriters' Laboratory procedures on T, TW, 90°C and 105°C coated wire. In the same series it shows outstanding moisture resistance, as well.

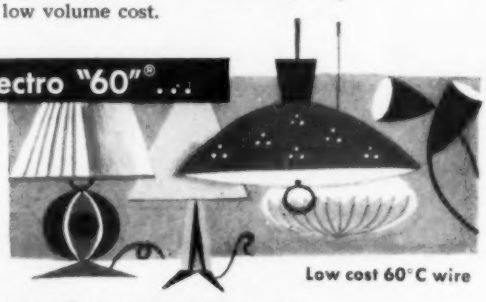
New Lectro* 77...

Special purpose 60°-80°C wire

A most versatile insulation stabilizer

Lectro **77** . . . another new "Dutch Boy" lead stabilizer . . . promises unique versatility. For one thing it is an unsually good stabilizer with phthalate and many special purpose plasticizers. Secondly it provides excellent resistivity and outstanding moisture resistance at unusually low volume cost.

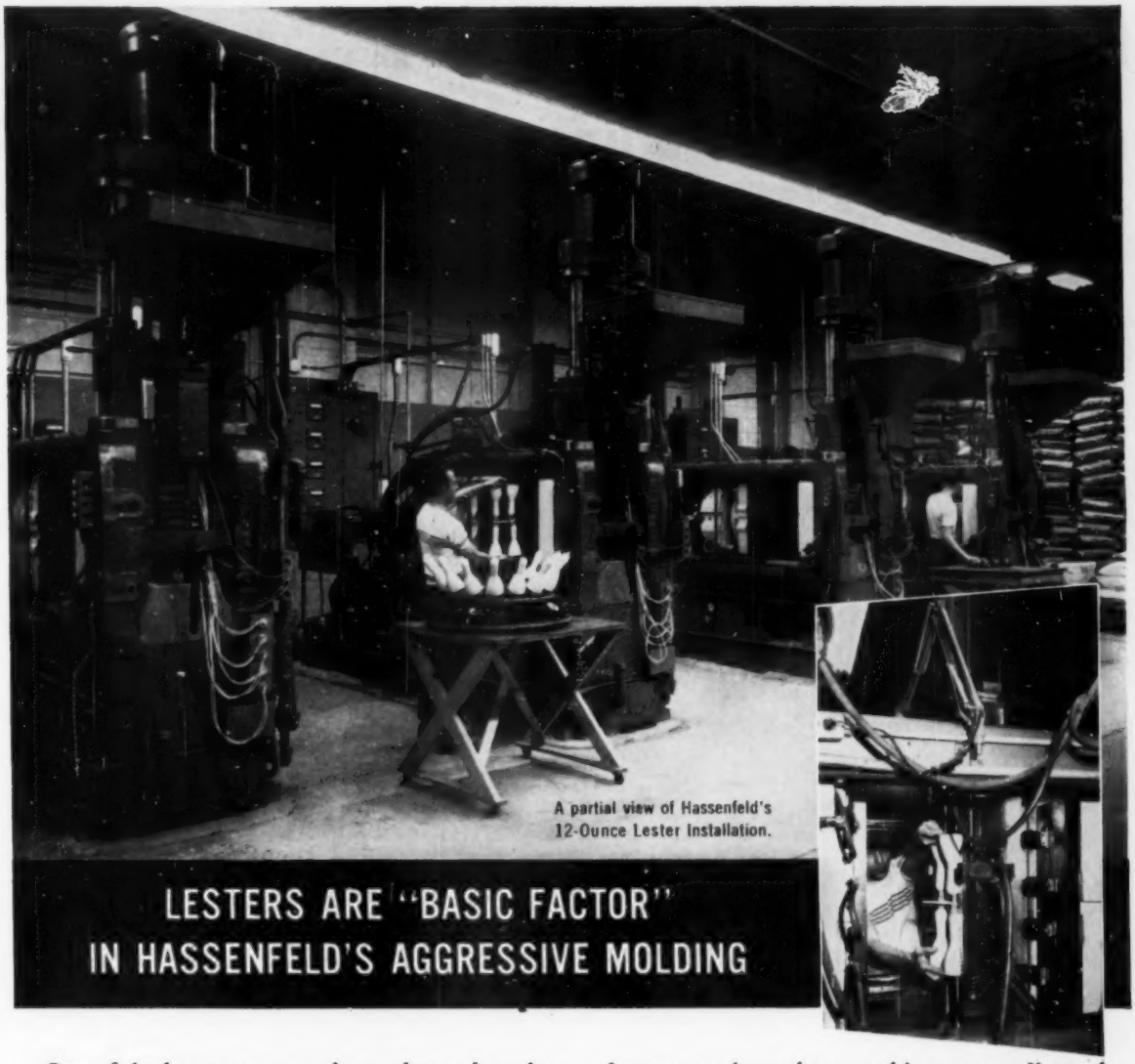
Lectro "60"®...



Low cost 60°C wire

"Dutch Boy" Stabilizer. For lowest volume cost

In 60°C wire, Lectro **60** lead stabilizer provides much the same benefits as Lectro **77** . . . combined with rock bottom volume cost.



A partial view of Hassenfeld's 12-Ounce Lester Installation.

LESTERS ARE "BASIC FACTOR" IN HASSENFELD'S AGGRESSIVE MOLDING

One of the hottest toys on the market and, at the same time, a fine example of superior molding technique, is the toy bowling pin project currently running at Hassenfeld Bros., Inc., at Central Falls, R.I.

The initial problem was to plan a product in four sizes that would stand up both literally and figuratively, compared to low-cost blow-molded parts and still be competitive in price with them. Naturally, they had to have the largest mold with greatest number of cavities possible for each part, consistent with a fast cycle.

Once again the wisdom of owning Lesters became evident to the Hassenfeld team. To quote Mr. H. P. O'Connor, of their mold engineering and design department, "The expanse of the platen area, the projected area, the amount to be plasticized, and the clamping and injection pressures of the 12-ounce Lesters were the factors in our pursuing this program. I might add here that had we not been fortunate to have these machines at our disposal, this whole story might not have come into being."

The molds were designed with unusual ingenuity. For example, on the #4 (largest) pin top, one double-acting cylinder first pulls the top cores and then the bottom cores, an action which is startling at first sight. In open extended position the mold measures 84 inches vertically, with 1/8" clearance between the beams of the one-piece Lester frame. The shot, in polyethylene, weighs about 10 ounces.

It is this type of imaginative, aggressive injection molding which proves the capability and versatility of Lester injection molding machines.

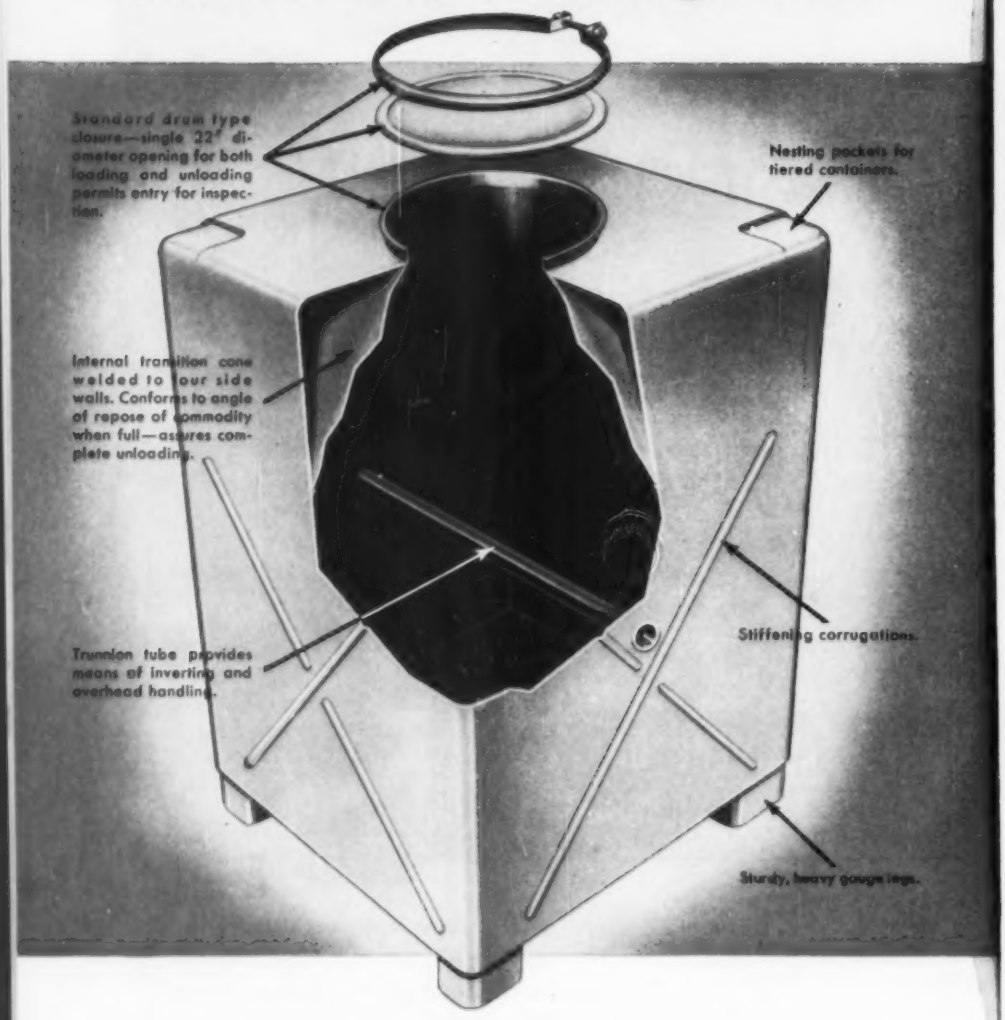
Do you have a tough project planned? Check what Lesters can do to help you.

LESTER-PHOENIX, INC.

2621-H CHURCH AVENUE • CLEVELAND 13, OHIO

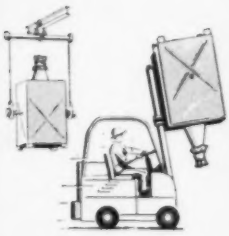
Agents in principal cities throughout the world

New Powell Invert-a-bin slashes bulk handling costs



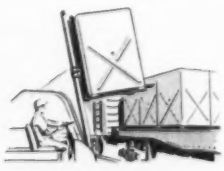
Fills Fast—22" opening permits fast filling of even powdered materials. Internal cone conforms to angle of repose.

Empties Clean—Internal cone funnels all materials out of bin. No residue remaining.



Used Anywhere—Standard handling equipment—no fancy unloading devices needed at every use area.

Stores Outdoors—Weatherproof, turns yard area into warehouse. Stacks 2 high.



Cuts Shipping Costs—low cost flat-bed equipment considered part of special rail car with "freight free" advantages.

For bulk handling dry granular or powdered materials—sugar—flour—plastics—chemicals—cement—etc.—in plant or between plants, the new patented Powell Invert-A-Bin made of steel or aluminum is the simplest, most versatile container ever developed.

Easily filled, easily inverted, quickly emptied, the Invert-A-Bin can be used anywhere without special devices at each use point. It stores safely outside, lets you take advantage of many transportation economies. Invert-A-Bins eliminate the use of disposable packages and bring you all the advantages of a bulk handling system without the costly investment. Get all the facts—write today for your copy of the Invert-A-Bin, Semi-bulk handling brochure

POWELL PRESSED STEEL Since 1920 HUBBARD, OHIO

THE POWELL PRESSED STEEL COMPANY

HUBBARD, OHIO

Lic. under pat. #2862645

MOLDED FOR
PLEWS OILER INC.
MINNEAPOLIS 15, MINN.

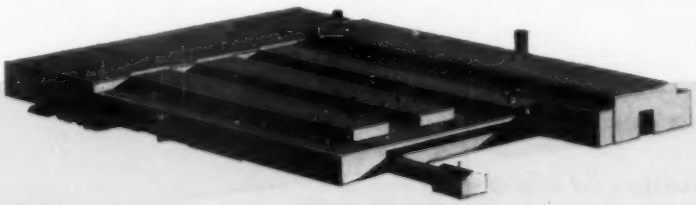
Another First...

From Minnesota Plastics the "HANDY LITTLE GREASER"

A perfect example of sound engineering and good product design aimed at producing a top quality product at low cost is the "HANDY LITTLE GREASER" produced for PLEWS OILER INC. for the home trade.

This light weight grease gun made of tough Tenite Butyrate plastic develops 3000 lb. pressure per square inch. The amber body allows full visibility of the grease supply while the 3" nozzle provides the necessary length to get at those hard to reach fittings. Lighter weight for lower shipping costs, bright colors for sales appeal plus low manufacturing costs without sacrificing quality add up to a good marketable product and a satisfied customer.

A complete service from "START TO FINISH" is ready to work for you to solve your problems.



MINNESOTA PLASTICS CORPORATION

45 E. MARYLAND AVENUE • SAINT PAUL 17, MINNESOTA

A Masterpiece produced by the TRIULZI Model PL 6/10

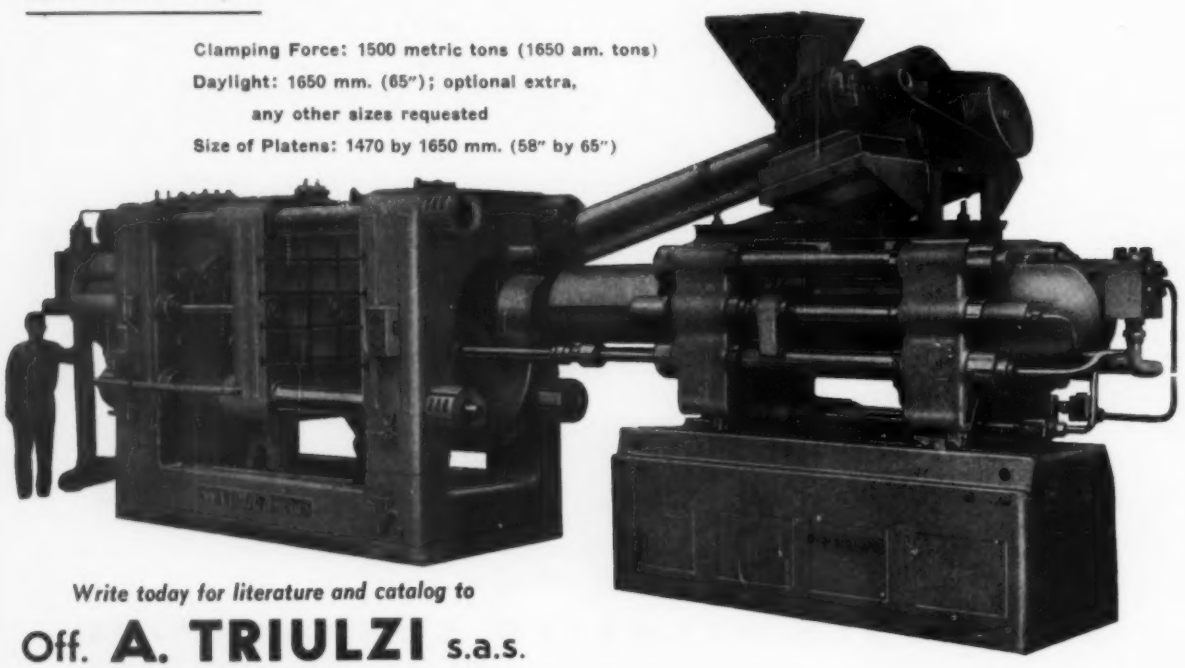
Europe's largest injection molding machine (350 oz.) . . . with preplasticizer and possibility for a wider daylight

PRODUCED FROM LOW PRESSURE POLYETHYLENE

Weight: 8,400 kg. (300 oz.)
Maximum ø: 750 mm. (30")
Minimum ø: 550 mm. (22")
Maximum Height: 650 mm. (26")

TRIULZI Model PL 6/10

Clamping Force: 1500 metric tons (1650 am. tons)
Daylight: 1650 mm. (65"); optional extra, any other sizes requested
Size of Platens: 1470 by 1650 mm. (58" by 65")



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U.S.I. POLYETHYLENE NEWS

A series for plastics and packaging executives by the makers of PETROTHENE® polyethylene resins

MARCH, 1959 — U.S. Industrial Chemicals Co., Division of National Distillers and Chemical Corporation — 99 Park Ave., N. Y. 16, N. Y.

Packaging Notes

New bread-wrap material is a sulphite-base sheet with an inner coating of polyethylene. The outer surface has a high gloss finish coating. The extruded poly inner surface provides an excellent air-moisture barrier. The sheet withstands the relatively high temperatures of wrapping hot bread and reportedly performs well on existing wrapping machinery.

Amber polyethylene containers are now being used to market photographic and other light-sensitive materials, according to a recent announcement. Lightweight, unbreakable and chemically inert, the containers provide light protection but still allow the user to see the level of the contents. Polyethylene's flexibility is said to be another advantage: Air can be removed and oxidation of the contents prevented by squeezing the bottle and replacing the cap to form a vacuum container.

Poly film and poly-coated corrugated board are combined in a new type of package. The packaged item is encased by vacuum-forming in tight fitting film which is bonded to the mounting board. The board is folded along scored lines and inserted into an outer sleeve of corrugated board for shipping. The method is said to be suitable for a wide variety of packaging applications, ranging from costly, fragile industrial parts to volume-marketed consumer products.

A new adhesive for laminating polyethylene to burlap and other fabrics has been developed. It is expected to be helpful to bag makers and shoe manufacturers seeking to laminate polyethylene with a wet adhesive instead of heat sealing. The adhesive is said to be particularly useful in the manufacture of bags used for fertilizer and feeds.

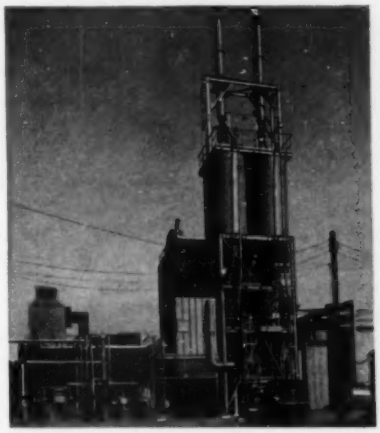
Machine which sets up tuck lid, poly-coated, bleached sulfate boxes and trays reportedly can produce up to 3000 units per hour. The machine heat-seals the box corners on the inside, leaving the exterior smooth and flat. Boxes and trays made by the machine are being used to package frozen foods, bakery products, candy, fresh foods and industrial parts.

A new polyethylene bottle with a rotating sleeve, also of polyethylene, has been designed to solve the problem of labeling. A horizontal channel for the sleeve is molded around the outside of the bottle. A paper label can be inserted in a vertical opening in the sleeve which is then rotated to cover the label. Inside the channel and protected by the sleeve, the label cannot fall off or be damaged by splashing liquids.

U.S.I. Starts Up New Plant at Tuscola For Compounding Petrothene® Resins

To Process 25 Million Lbs. of Resin Per Year

A new plant for compounding polyethylene resins with carbon black and other additives has been opened by U.S.I. at its petrochemical complex at Tuscola, Ill. The plant, which will handle 25 million pounds of resin a year, enables U.S.I. to assure its resin customers of even higher quality control than previously.



U.S.I.'s new polyethylene resin compounding plant at Tuscola, Ill., will handle 25 million pounds of resin a year.

In polyethylene pipe and electrical applications, the care with which carbon black is compounded with the resin has an important effect on the weather resistance of the finished product.

Weather resistance of a polyethylene compound depends on three factors: (1) type and particle size of carbon black; (2) percentage of carbon black in the compound; (3) dispersion of the carbon black in the compound.

Dispersion is particularly important. Tests show that good dispersion will enable polyethylene to withstand 15 to 20 times as much exposure as polyethylene with poorly dispersed carbon black.

At U.S.I.'s new compounding plant, only the finest channel black is employed in compounding the wire and cable grades of PETROTHENE resins. Concentration is set at a point which yields the optimum balance of light screening and other properties. Special processing equipment insures thorough dispersion.

Users of black electrical grade polyethylene can get technical data on PETROTHENE resins expressly formulated for electrical applications by contacting their nearest U.S.I. office.

Booklet Lists U.S.I. Resins For Wire, Cable Industry

U.S.I. has issued a four-page booklet classifying the special physical and electrical properties of PETROTHENE polyethylene resins. The booklet lists resins by application, essential properties, and industry specifications. Copies may be obtained by writing to Editor, U.S.I. Polyethylene News, U.S. Industrial Chemicals Co., 99 Park Avenue, New York 16, N. Y.

U.S.I. To Show Cast Film at Packaging Show

Ultra-clear cast film, printed film and other special packaging films will be featured in U.S.I.'s exhibit at the 28th AMA National Packaging Show in the Chicago International Amphitheatre, April 13-16. A team of technical service engineers will also be on hand at the U.S.I. booth (booth No. 1133-1135) to answer questions on packaging applications of films made from PETROTHENE polyethylene resins.

Injection-Mold Poly Tanks With 31-Gallon Capacity

Polyethylene tanks with a capacity of 31 gallons are now being injection-molded for use as salt storage containers for automatic water softeners. The 100-ounce tanks are believed to be among the largest deep-draft parts ever produced by the injection process.

The poly brine tanks measure 21 inches deep, with a maximum diameter of 21 inches. Designed with a two degree draft, they may be nested for economical shipment and storage. The tanks are molded on a specially modified 200-ounce injection machine which operates on a molding cycle of better than 20 shots per hour. The corrosion-resistant, dent-proof polyethylene tanks replace galvanized steel containers formerly used for this application.

U.S.I.

Vol. IV, No. 2

POLYETHYLENE PROCESSING TIPS

CAST FILM PROCESS GIVES TOP CLARITY FILM

Film extruders seeking greater clarity and gloss should investigate the cast film process. With this technique, you can produce polyethylene film with clarity equal or superior to that of other commonly used transparent packaging materials.

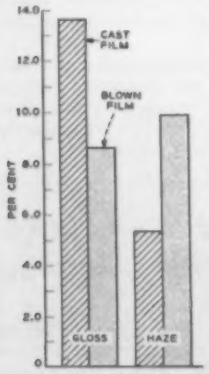
Casting Procedure

Casting involves extruding a molten web of polyethylene on a mirror-finished, water-cooled roll. Either standard flat-film extrusion equipment or conventional extrusion coating equipment can be modified for use with the new process.

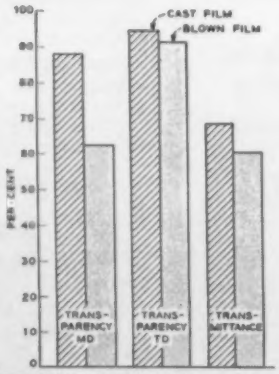
The melt is extruded through a slot die onto chrome-plated chilled rolls where it cools rapidly and solidifies. Under tension maintained by a driven windup roll and guide bars, the film is transferred at controlled speed over idler bars to a razor or score-cut slitter roll. The idler rolls permit further cooling before winding; and in trimming ½" to 1" from the film edges, the slitters remove the bead from the film edge.

Relation Between Properties and Process

Cast film has outstanding optical properties because the process controls the two principal causes of haziness in polyethylene film: surface roughness, which diffuses light passing through the film; and a partly amorphous-partly crystalline resin structure, which results in uneven light diffraction.



Comparison of optical properties (gloss & haze) of cast film vs. blown film (angle of incidence = 60°)



Comparison of optical properties (transparency & transmittance) of cast film vs. blown film

The casting roll surface determines the surface characteristics of the film. Consequently, cast film has as smooth a surface as the highly polished rolls whose contour it follows.

Haze-producing crystals in the matrix of the polyethylene are held to a minimum by keeping the film at high temperature until it hits the chill roll. The more rapid the cooling rate, the fewer the crystals and the smaller the spherulites – and the clearer the film.

Optimum Operating Conditions

Efficient production rates – generally faster than conventional methods – can be achieved by a proper balance of operating variables.

A die setting of 10 to 20 mils is recommended. A lower setting produces higher gloss and a significant reduction in neck-in tendency, but more blocking. Keeping the draw-down distance between the die lip and chill roll to a minimum also reduces neck-in, thereby making it easier to attain uniform gauge.

Excellent gauge control is possible in a range of film widths and in gauges from 0.5 to 4.5 mils. As gauge increases, a reduction in blocking occurs.

As low a stock temperature as possible will give best results for blocking and neck-in properties. Since gloss is impaired at low stock temperatures, the minimum temperature should probably be not less than 400°F.

A uniform "frost line" must be maintained as the film is cast. This is an indication that the melt is solidifying uniformly, that gauge is uniform, and that there will be no puckering or warping of film. It is achieved by balancing the chill roll temperature with the lineal speed and gauge of the film being extruded.

Sealing characteristics of cast film are not critical in either transverse or machine direction. Transverse-direction seals require a higher sealing temperature.

Choice of Resin

Lower density resins generally can be extruded into films with good optical properties by the cast film technique. It is therefore not necessary to make a large sacrifice of strength for clarity. PETROTHENE® 239 has been found to have the combination of properties most extruders require for such applications as overwrap, bread wrap and soft goods bags.

U.S.I. has pioneered in the cast film process, and is continuing to work in the lab and in the field on improvements in production methods. Our engineers will be glad to assist you in evaluating this new technique in your operations. Contact your nearest U.S.I. office or write:

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corporation
99 Park Ave., New York 16, N.Y.
Branches in principal cities

For profitable plastic injection molding of small parts involving inserts or loose cores . . . the

"Eldorado" MINI-JECTOR®

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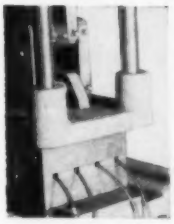
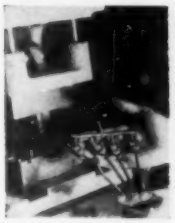
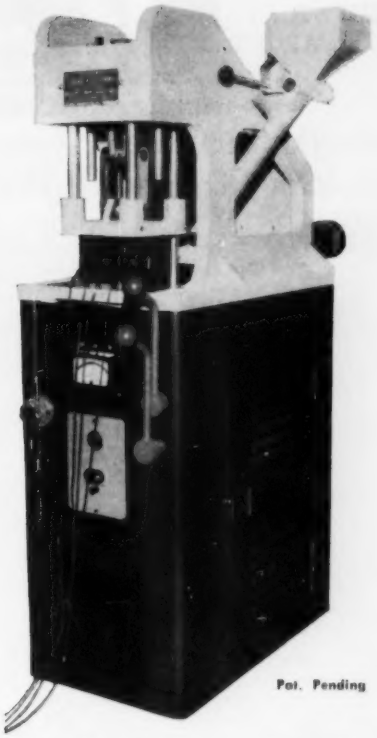
Plastic Injection Molding Machines





Left—Close up of mold in open position. Note unobstructed access to mold area. *Center*—Close up of mold in closed position. *Right*—Cycle completed. The molding of cord endings shown represents only one of hundreds of applications, but as they are familiar objects they make it easy to visualize the capacity range of the "Eldorados."



Pat. Pending

Standard "Eldorado" MINI-JECTOR, model 70VC95—lever controlled hydraulic mold closing and clamping.

"Eldorado" MINI-JECTORS are designed to solve a specific injection molding problem. They are the ideal answer to *fast, low-cost* production of small parts (1/3 oz. to 1 1/2 oz.) around inserts or loose cores. "Eldorado" MINI-JECTORS are daily molding a wide variety of precision parts in all thermoplastics for leading producers.

The "Eldorado" MINI-JECTOR is hydraulically operated and is available either with lever controls or for semi-automatic operation.

You'll like these exclusive features:

- *No front tie rods* to hinder operator's easy access to mold area when mold is open.
- *Vertical Clamp Operation*—Inserts or loose cores remain undisturbed because bottom of mold is always stationary.
- *Simple to Operate*—No special skill needed for efficient operation.
- *Hydraulic Power*—Self-contained Vickers hydraulic system powers mold closing and injection.
- *Low Initial Cost*—Under $3,500 for standard model, complete, ready to run, including mold blank.

Super "Eldorado" MINI-JECTOR, model 70VC105, offers semi-automatic operation in addition to features of Standard model.

"Wasp" MINI-JECTOR, with air or hydraulic power, provides capacity of 1/3 to 1 oz. Uses small "V" molds.

"Hornet" MINI-JECTOR has horizontal clamping and mold area of 6" x 5-1/8" x 5". Molding capacity up to 1 oz.

There's a MINI-JECTOR made to solve *your* small capacity (1/3 oz. to 1 1/2 oz.) molding problems.

Mail coupon for catalog covering all models.

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Box 31, Newbury, Ohio

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Box 31, Newbury, Ohio

HERE'S THE STORY ABOUT **Moplen*** POLYPROPYLENE: New isotactic "MOPLEN" resin has low density, high heat resistance, excellent dielectric properties and high resistance to chemicals.

PROCESSING OF "MOPLEN"

INJECTION MOLDING The high fluidity of "MOPLEN" permits molding of thin walled and complex shaped items.

Temperatures — Cylinder temperature should be maintained between 200°C and 250°C (392-482°F), depending on the form and weight of the molded piece, and should never exceed 270°C (518°F). Temperature at the nozzle should be about 30°C (54°F) less than that in the cylinder.

Pressure—Pressure should not be lower than 1200 kg/cm² (17,000 psi). Higher pressures (21,000 to 28,000 lbs/in²) are preferred.

Cycle times — May be very short, as in the case of polyethylene, using high injection speed.

Mold temperature — It is particularly recommended that the mold be run at not less than 50°C (122°F). The mold must be carefully chromium plated in order to obtain very smooth and brilliant surfaces.

Linear Shrinkage — Linear shrinkage varies from 1-2%. Normal rules should be followed when establishing mold sizes.

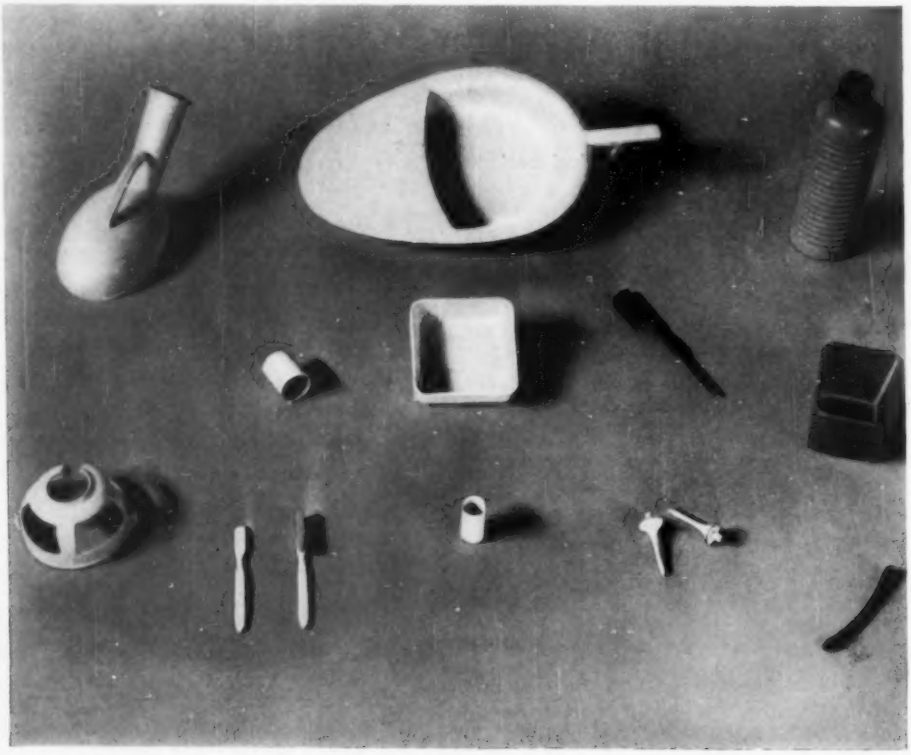
Coloring — All colors and shades can be obtained with "MOPLEN."

Protection against oxidation — Like polyethylene, the addition of carbon black with uniform dispersion, or similar opacifying agents, will impart permanent resistance to sunlight. "MOPLEN" is not affected by diffuse light.

For more detailed information about MOPLEN please write, outlining area of interest, to

Chemore Corporation
General Representative in U.S.A. and Canada for Montecatini
21 West St., New York 6, N. Y.

Sanitary products made from "MOPLEN" isotactic polypropylenes have excellent resistance to acids, alkalis, and various solvents. They are easily cleaned and sterilized. Economically produced in any desired color, with a high finish and excellent detail, they are light and warm to the touch.



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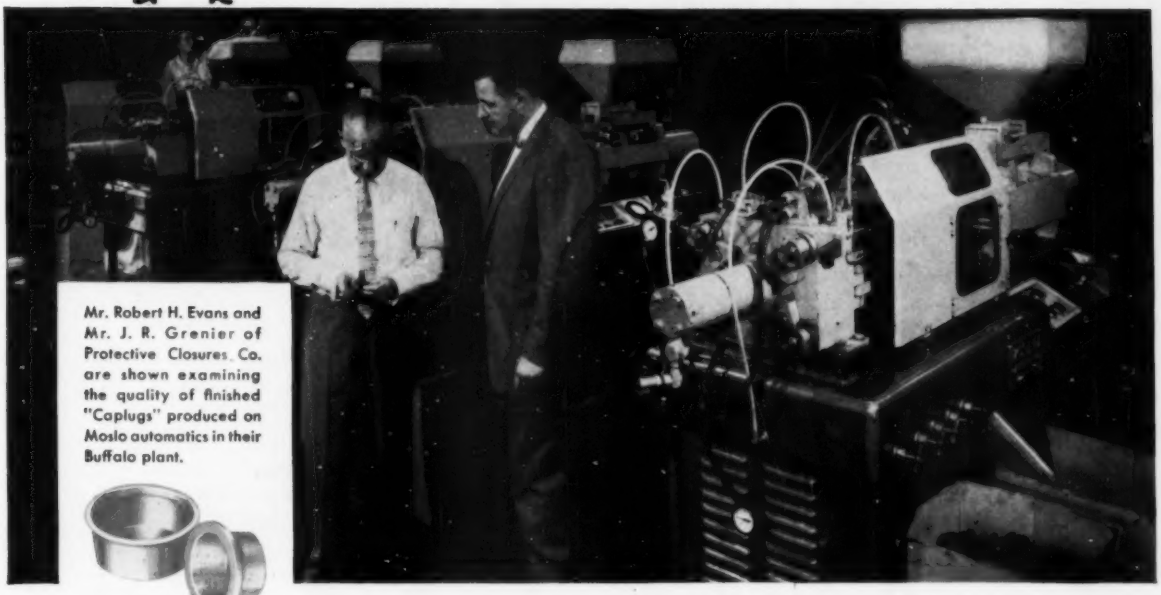
PROTECTIVE CLOSURES CO.

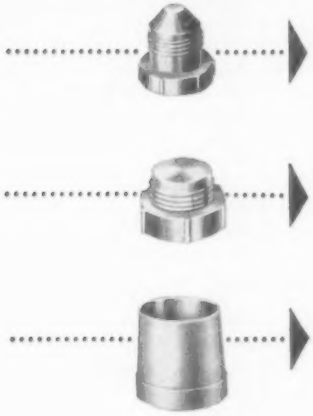
profits three ways



Mr. Robert H. Evans and Mr. J. R. Grenier of Protective Closures Co. are shown examining the quality of finished "Caplugs" produced on Moslo automatics in their Buffalo plant.

Caplugs

with MOSLO Molding Machines



Protective Closures Co., Inc. of Buffalo, New York, is a leading producer of high quality products in the closure industry. In their plant they have a battery of eight MOSLO Model 74 two-ounce automatics to produce their fast-growing line of "Caplugs."

Mr. J. R. Grenier of Protective Closures says, "We selected Moslo presses over larger equipment because less expensive molds, with fewer cavities, can be run fully automatically for greater efficiency and increased profits."

The clean, simple and efficient design of Moslo Plastic Injection Molding Machines, for automatic production of small plastic parts up to 4 ounces can help your profit picture, too. Write today for additional literature on the machines with "Built-in Efficiency."

WORLD'S FINEST PLASTIC INJECTION MOLDING MACHINES

MOSLO
MACHINERY COMPANY
3462 Prospect Avenue
Cleveland 15, Ohio

Please send descriptive literature on
- ☐ Model "74" 2 ounce Automatic
- ☐ Model "75" 4 ounce Automatic
- ☐ "Duplimatic" for cord plug and insert molding

Name_____ Title_____
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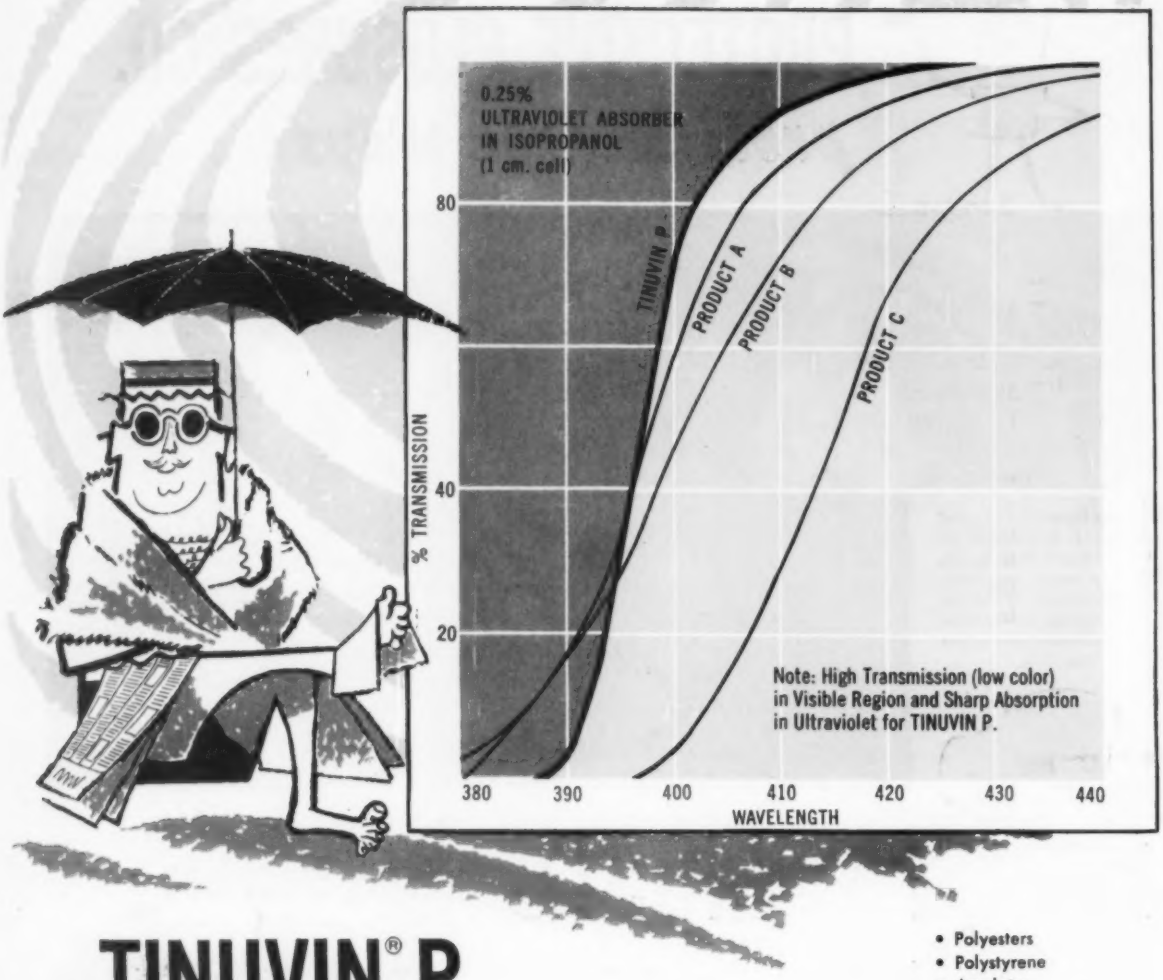

TINUVIN® P

protects against ultraviolet radiation

TINUVIN P (CH3457) is a new *Benzotriazole* Ultraviolet Absorber for protection of plastics and other products affected by actinic radiation. TINUVIN P combines superior light, heat and chemical stability with maximum ultraviolet absorption without yellowing. *(pat. appl.)*

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SUGGESTED APPLICATIONS

- Polyesters
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- Packaging Film
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THE PLASTISCOPE*

News and interpretations of the news — By R. L. Van Boskirk

Section 1 — **March 1959**

Will 1959 be a year of price decline? Economists who worry about inflation must look the other way when plastics materials are involved. Since December of 1958 there have been price cuts in vinyl chloride, polyolefins, polyester laminating resin, Teflon, polystyrene, and plasticizers.

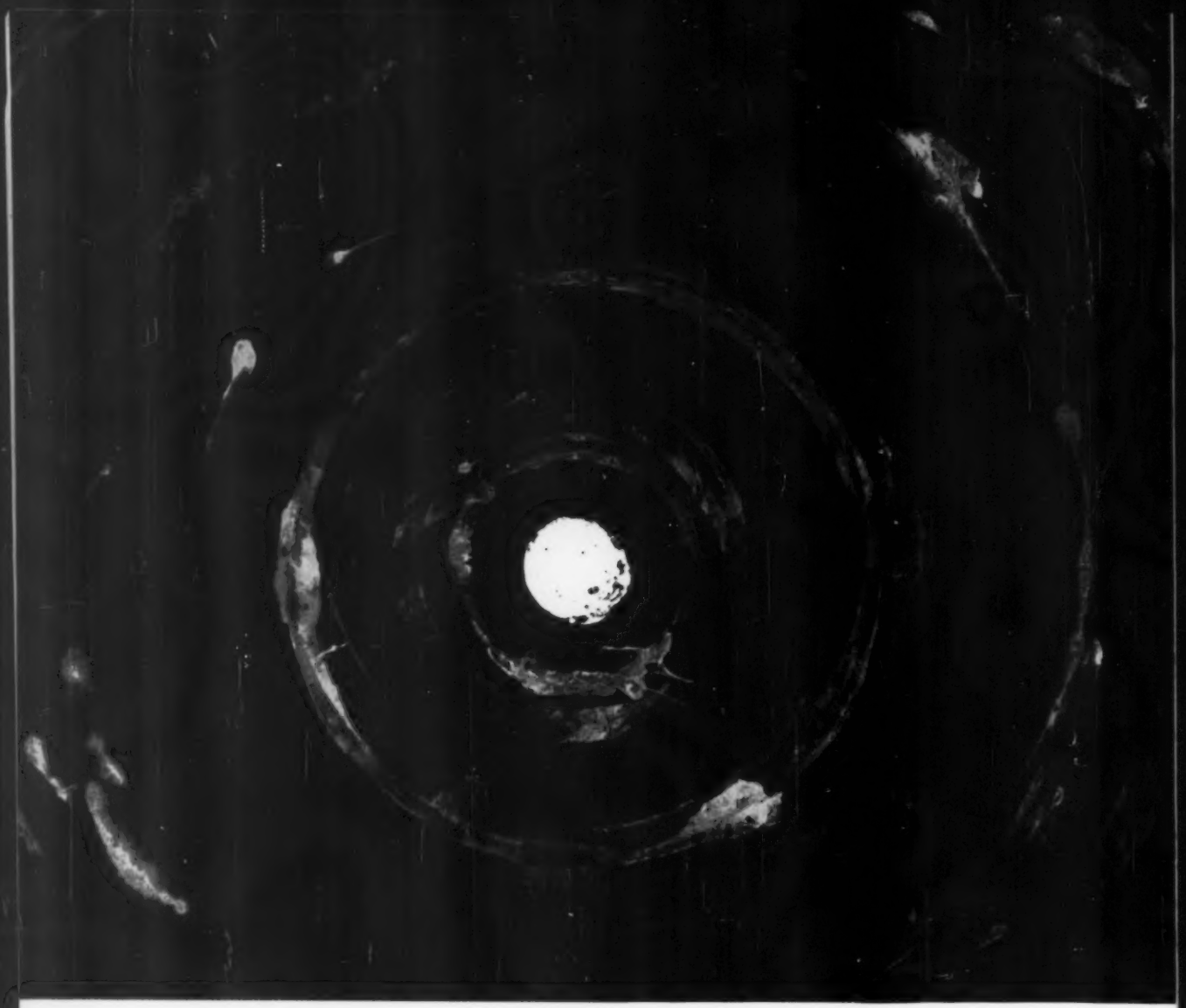
The first two were covered in this column last month. The polyester price for phthalic-based resins was reduced 1¢/lb. in February. Teflon was reduced 8 to 10% (details on p. 206). The polystyrene situation is discussed in detail on page 194. It is notable for the extent of the drop (from 24¼ to 21½¢ in general purpose crystal) and for the inclusion of impact material in the price decline for the first time in several years. It is also unusual for a change in the difference between crystal and colored material that will make it possible to obtain bulk shipment of certain colors at only 1½¢ more than crystal in contrast to a former differential of from 3 to 4 cents. The industry is buzzing with comment on this revolutionary change and is mighty curious to see how it will work. One of the first interesting developments probably related to this price situation is a notice that American Cyanamid will discontinue methylstyrene-based Cymac molding compounds "in order to concentrate its efforts in fields of greater economic promise."

Another wedding in the plastics industry. Many experts have testified that when plastics became married to other materials volume use would increase in unpredictable quantity. The dawn of that polygamous era seems near at hand. Many examples can be pointed out, such as resin and glass, polyester film on metals and wood, vinyl sheeting on fabric and metal, and even the marriage of plastic to plastic such as the various laminates in the packaging field. But foremost among the future possibilities are vinyl plastisols. A plastisol-metal-paper air filter for carburetors in automobiles has already made its debut; a plastisol-coated rubber mat for autos looks promising. However, the most sensational news at the moment is the spread-coated plastisol-steel paneling recently announced by U. S. Steel.

Details on how this operation is performed were printed in MODERN PLASTICS in September 1958 in an article describing the Sun Steel operation. But when a company the size of U. S. Steel enters the field, with its vast distribution facilities made available and an assurance that markets are already opened up, the impetus is bound to be staggering.

U. S. Steel vinyl-metal sheet. The new U. S. Steel plastisol-coated sheet can be handled almost as though it were uncoated. It will withstand elongation of 30% with no effect on the coating. There is no under-film corrosion and even the uncoated back can be protected with epoxy resins or other (*To page 43*)

Reg. U.S. Pat. Off.



CYASORB*... the biggest brand name in product protection under the destructive sun!

CYASORB Light Absorbers provide the ultimate in protection against damaging ultraviolet. Easily and economically incorporated into most formulations, CYASORB Light Absorbers will actively prevent UV-caused degradation . . . . open up many new markets for *your* product.

IN PVC, for example, CYASORB UV 24 Light Absorber prevents browning, spotting and embrittlement caused by sunlight. During exposure tests in Florida and Arizona, PVC samples treated with 0.2 phr CYASORB UV 24 showed an average life span five times greater than untreated control samples.

IN **POLYESTERS,** clear unprotected ⅛-inch castings showed pronounced yellowing when exposed to a GE S-1 sun lamp for two hundred hours. Identical samples, with 0.25% CYASORB UV 9 added, showed less yellowing, *even when exposure was increased fivefold.*

IN POLYSTYRENE, samples containing 0.2% CYASORB UV 9 showed 50% less yellowing than untreated controls after 400 hours in Fade-Ometer.

IN SURFACE COATINGS and thin films, CYASORB UV 24 provides outstanding protection to the substrate and to the film itself. An .0008-inch plastic coating containing .004 ounces of CYASORB UV 24 per square foot screened out 91% of the ultraviolet that passed through a similar, but unprotected, system. (Both films were coated on glass.)

These few examples show the effectiveness of CYASORB Light Absorbers even in fractional percentages. If you have a problem involving ultraviolet degradation, Cyanamid's unequaled experience in the use of UV light absorbers is readily at your disposal. Just write us. *Trademark

AMERICAN CYANAMID COMPANY
Intermediates Department
Bound Brook, New Jersey

CYANAMID

THE PLASTISCOPE

(Continued from page 41)

materials if desired. The coating is embossed in any desired color while it is still warm after emerging from the coater. It will take 160° F. on a continuous basis, 212° for two days. Coating thickness can range from 0.008 to 0.020 inch. The coated material may be supplied in sheets or coils. According to officials it is about 2½ times the price of steel alone but generally less expensive than stainless steel, anodized aluminum, upholstery, porcelain enamel, and other decorative material. Formulators of the plastisol, adhesives and reverse surface protection were listed as Dennis Chemical Co., Stoner-Mudge, Pittsburgh Plate Glass and Stanley Chemical. All patterns offered by U. S. Steel were developed by Peter Muller-Munk Assoc., Pittsburgh, Pa.

Markets for coated steel. Commercial products already in the market for U. S. Steel coated metal are portable electric heaters, room coolers, movable steel wall partitions, folding chairs, office tape dispensers, and doors. Fields of application include automobile interiors, appliance cabinets, architectural products, railroad car and bus interiors, office fixtures, and furniture.

Another plant for polypropylene. A joint company equally owned by Sun Oil Co. and American Viscose Corp. has been formed to produce polypropylene. The affiliate will be known as AviSun Corp. Commercial quantities of resin will be available by midsummer from leased facilities of the Port Reading, N. J. linear polyethylene plant of Koppers Co., Inc. One line of the plant is now being modified for polypropylene production using a process developed in the research laboratories of Sun Oil. Koppers will operate under the technical direction of AviSun. Capacity of the converted plant is estimated to be 20 million lb. a year.

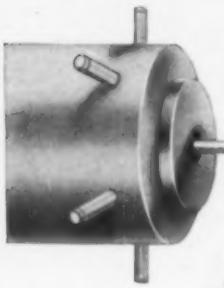
American Viscose researchers have developed new processes for the manufacture of polypropylene film and fibers. AviSun Corp. will be integrated for the manufacture, processing, and sale of resins, film, fibers, elastomers, surface coatings, and adhesives using olefin polymers or copolymers with other substances.

Polyolefin blending resin. Blending high- and low-density polyethylene (PE) has become fairly common practice over the past year. The usual procedure was for the molder or processor to blend a 0.950 or 0.960 density resin with a conventional low-density resin so that he could obtain good stiffness along with good flow. Since high-density resins have a low melt index they are difficult to use in large moldings because of poor flow, but the addition of a low-density conventional PE resin with indexes that run all the way up to 20 or more helped overcome that problem.

Celanese Corp. of America has now introduced a high-density resin (Fortiflex A-800) with an MI of 8 (in contrast to the usual 2 or 4 for high-density molding resins), that is intended exclusively for blending with conventional resins; thus the user can blend a well mixed formulation with a good, uniform flow that has not only stiffness but the proper viscosity for filling large molds. Fortiflex A-800 *cannot* be used alone since its melt index *(To page 45)*

VYGEN-120 PVC RESIN

now approved for production of clear plastic tubing



additional proof of VYGEN'S outstanding quality

Clear surgical and pharmaceutical tubing must be of the very finest quality and uniformity—thus the resin used in its manufacture has to be the very best. Vygen has been proven completely satisfactory in this application, as it has in so many others calling for a truly top-quality resin.

Every phase of Vygen production—from raw material through glass-lined equipment to final packaging—is carefully controlled and tested to assure a perfect product. Vygen puts outstanding quality, absolute uniformity, good clarity, heat stability and long life into any extrusion, and dry blends with either polymeric or monomeric plasticizers. Write now for information on how versatile Vygen fits your needs.

TYPICAL ANALYSIS

Form—White powder
Intrinsic Viscosity—1.18
Specific Gravity—1.40
Bulk density, gm/cc—0.52
lbs/ft^3—32.5
Volatiles—0.2

Chemical Division GENERAL THE GENERAL TIRE & RUBBER CO. VYGEN

THE GENERAL TIRE & RUBBER COMPANY
CHEMICAL DIVISION • AKRON, OHIO
Creating Progress Through Chemistry

THE PLASTISCOPE

(*Continued from page 43*)

is too high for proper molding of high density material. Properties of heat resistance, rigidity, etc. of products molded from this blend of high-density (linear) and conventional polyethylene fall between the limits of the two types of PE, depending on the percentage used. The price of Fortiflex A-800 is the same as other high-density resins.

Goodyear's new 1-mil film receives PFDA approval. What is claimed to be the first extruded, *plasticized* PVC film approved for food packaging by the Pure Food and Drug Administration and offered on a commercial basis, has been announced by the Goodyear Tire & Rubber Co. Called Vitafilm F, the new 1-mil film is being marketed at 73¢/lb. with a yield of 21,500 sq. in. per pound. Heretofore it has been difficult to obtain PFDA approval because of problems encountered with plasticizers and stabilizers. The film can be utilized either in straight or overwrap applications and readily laminates to paper, film or foil to produce special pouch-type packages.

Foreign shipments of polyethylene. Recent figures released by the Census Bureau indicate that exported polyethylene volume in 1958 will be close to 250 million pounds. November alone was over 25.5 million. Total consumption of U. S. polyethylene in 1958, including export, was around 825 million. This foreign business is expected to decline in 1960 or '61 because of overseas plants.

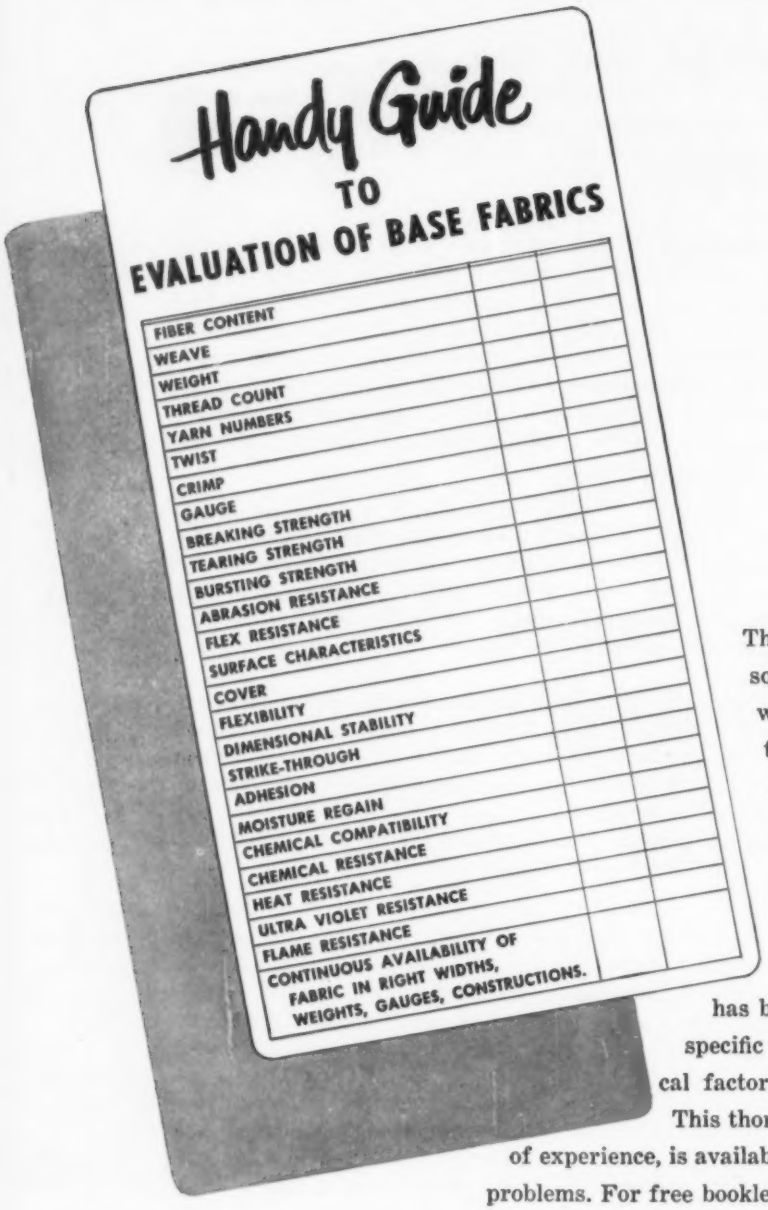
A good number of the foreign plants are owned or partly owned by American companies. For example Union Carbide is interested in a Scottish plant of 30 million lb. capacity; a 30 million lb. Belgian plant; a 30 million lb. plant in Sicily; a plant in Canada that may soon have 40 million lb. capacity; another in Brazil of 10 million and one in India of 9 million now under construction. The company has recently announced a 15 million lb. plant for Melbourne, Australia which will start production in 1961.

Vinyl-coated glass aerosols. A new line of plastic-coated shatterproof glass pressure packages has been developed by Owens-Illinois Glass Co., and production of these containers has started at the company's Fairmont, W. Va. plant.

The company can supply packages for both liquefied and compressed gases of the Freon and Nitrosol varieties, but does not make valves and fitments.

Present uses for plastic-coated glass aerosols are mainly in the toiletries and cosmetic field, but these packages are being considered in a variety of products in the pharmaceutical, proprietary, household, chemical, and other fields. Since the introduction of plastic-coated glass aerosols in 1955, production increased by about 50% annually, reaching 21,280,000 in 1957—the latest year for which figures are available. Wheaton Glass is at present the only other producer of vinyl-coated glass aerosols.

Heat resistant methacrylate. J. T. Baker Chemical Co., Phillipsburg, N. J., has officially announced development of a new transparent methacrylate polymer for injection molding and extrusion with a heat distortion temperature of about 250° F., claimed to be approximately 50° F. higher (*To page 47*)



This fictitious "guide" has been created solely to show some of the factors which often have to be considered in the selection of a base fabric. They serve only to point up one fact: that there can be *no* such thing as a put-it-in-your-pocket guide in this field. But one thing is certain: when you're guided by Wellington Sears, you know that your base fabric has been considered in the light of your specific need, and that all significant technical factors have been thoroughly examined. This thoroughness, plus more than a century of experience, is available to help solve *your* working-fabric problems. For free booklet, "Fabrics Plus," write Dept. K-3.

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WEST POINT TEXTILES

THE PLASTISCOPE

(*Continued from page 45*)

than conventional methacrylate. Designated as PL-11, it is similar in mechanical and optical properties to other methacrylates and has been immersed indefinitely in boiling water without affecting its water-white transparency. Limited quantities are being produced for market evaluation.

Rexall drives another wedge in plastics industry. No one but Rexall knows how far that company is going to dig into the plastics business, but the present pattern is most unusual and gives Rexall a unique position with a variety of holdings that are as variegated as the consumer items that one would find in a Rexall drug store. The purchase of Chippewa Plastics, a polyethylene film producer, adds to the variety. The transaction called for the exchange of one share of Rexall stock for two shares of Chippewa common with adjustments for Chippewa preferred stock.

Chippewa is one of the larger so-called independent polyethylene film producers. There have been many rumors concerning a possible purchaser of the company for many months, but none of them guessed right on the eventual buyer. Since nearly all the major conventional PE producers now own or work closely with a film producer, it will be interesting to see how Chippewa operates with financial backing sufficient to compete at any level. Nor should it be unnoticed that Rexall also owns Tupper Molding Corp. one of the largest consumers of PE in the U. S. With two large consumers in hand Rexall may well be thinking of becoming a raw material producer. Indeed Rexall is already in one phase of raw material production—the Seamco polystyrene plant in New England that has already created some stir among other polystyrene producers with its merchandising policies.

Rexall also owns Kraloy, a large plastic pipe producer and Chemtrol, a producer of plastic pipe fittings, both in California, but with distributors as far east as Florida. Seamless Rubber, a molder of rubber drug sundries is another Rexall property located in New England. In addition Rexall controls five or six other manufacturing establishments some of which have no relation to the drug or plastics industry. As mentioned above—here is a pattern of something new in plastics that bears watching.

Phenolic-sisal molding material. This type material in nodular molding form was first introduced in 1957. A new entrant in the field is Rogers Corp., Rogers, Conn., with formulations named RV-825 and RX-831 that are two-step molding compounds which can be preformed and molded on conventional equipment. Durez and Fiberite entered the field previously. Union Carbide Plastics has a resin for this purpose but sells only the resin and know-how to the molder who does his own formulating with sisal filler.

These sisal filled phenolic nodular resins now sell for 27¢/lb. and reportedly made good progress in 1958. An 8-lb. tray-like piece for air-conditioning equipment, used with foamed-in place urethane, is a new application. It was formerly in polyester, but the phenolic is self-extinguishing. Pulley jobs that were once die cast are another application. Other potential uses are electrical and motor housings, outlet boxes and others.

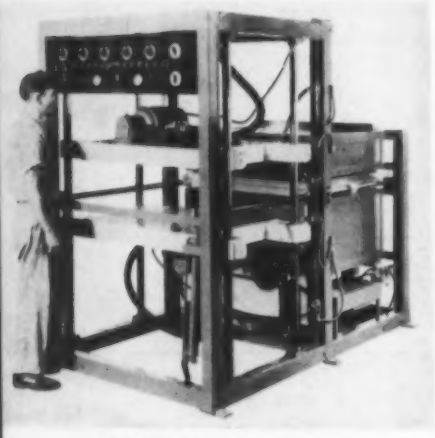
For additional and more detailed news see Section 2, starting on p. 194

MACHINERY AND EQUIPMENT

Specifications, claims made, and prices appearing in these pages are those of the manufacturers or sellers of the machinery and equipment described, or their agents.*

Sheet thermoforming machine

The Comet Star machines incorporate all the known forming techniques including vacuum snap back, plug assist, inverted drape, billow and air-cushion forming, pressure forming, and plug-and-ring. These features are made possible by two counteracting platens which are electrically driven and independently controlled. Each platen has its own separate vacuum and pressure system, can make a 30-in. stroke at 15 in./sec. Other strokes and variable-speed drives can be had on special units. The two banks of heaters, above and below the sheet, are well insulated and are independently controlled through percentage-input timers. The three standard machines have forming areas of 30 by 36, 36 by 50, and 48 by 72 inches. Clamping frame may be either book or box type. *Comet Industries, 9865 Franklin Ave., Franklin Park, Ill.*



COMET Star thermoforming machine has two counteracting platens that make possible vacuum snap back, plug assist, inverted drape, billow, air cushion, plug and ring, and pressure forming.

Semi-bulk handling equipment

The Invert-A-Bin is a shipping, storage, and loading-unloading container for handling molding powders, resins, and other dry, flowable products. Available in 36-, 65-, and 88-cu. ft. capacities, the units are fabricated of steel or aluminum and hold loads of 6000 lb. or more. An internal transition cone welded to four side walls conforms to angle of repose of commodity when full and assures complete unloading. A trunnion tube provides means of inverting and overhead handling. Closure is of the standard drum type. The single opening used for both loading and unloading is 22 in. in diameter. In use, the cover is removed and an emptying cone with tie-off sleeve assembled to the opening. Turned over, the unit is then ready for complete discharge. Only one turn-over device is required per installation as the inverted unit can be moved by standard fork truck to any number of operating stations within the plant. *The Powell Pressed Steel Co., Hubbard, Ohio.*

Chop saw attachment

Designed to quickly and easily convert electric hand saws into precision high production chop saws, a low-cost portable attachment makes possible accurate cuts in plastics, non-ferrous metals, wood, rubber, and other materials. For mitre cuts, the attachment swings freely and easily to the desired angle. The CTD chop saw attachment accommodates electric hand saws, such as the Porter-Cable, Skil, etc., quickly and simply. Attachment and saw are easily carried to job-sites since the complete weight of saw and attachment is only 36 pounds. *Commercial Tool & Die Co., 2315 Jesse St., Los Angeles 23, Calif.*

Vacuum chamber for plastometer

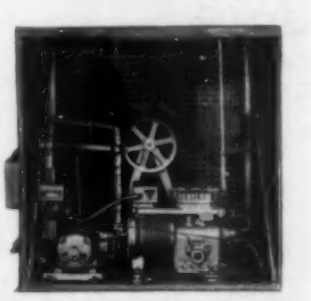
The Brabender Plastograph can be inexpensively fitted with a vacuum chamber to provide measurement of plasticity of polymers under vacuum. (Where very high precision is required in such measurements, a special heavy-duty model is recommended. This model can handle all polymers, including solid propellants, and can operate at temperatures up to 625° F.) The new standard model has an 0.5-hp. dynamometer—twice the power of the older models—and it, too, is capable of operating to 625° F. Older models can be rebuilt to include vacuum and higher-power features. *C. W. Brabender Instruments, Inc., 50 E. Wesley St., South Hackensack, N. J.*

Tensile-impact tester

Owners of TMI Izod-impact testers can modify them for tensile-impact testing by substituting a new hammer and stop now available from the maker. Complete machines for tensile-impact testing are also available. The new hammer, stop and grips are so designed that as the hammer reaches the bottom of its swing, one of the grips is arrested by the stop while the other swings on with the hammer. The energy that is absorbed in rupturing the specimen is read on the usual scales. *Testing Machines, Inc., 72 Jericho Turnpike, Mineola, N. Y.*

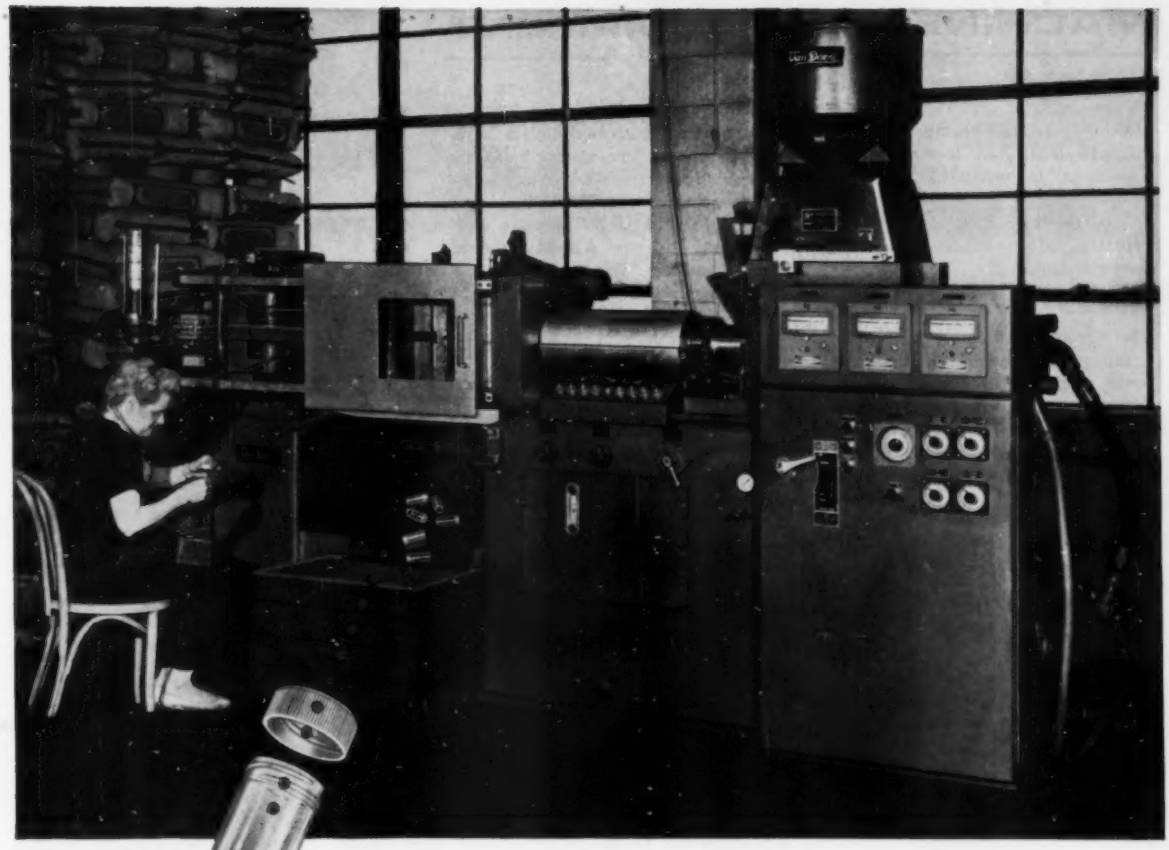
Liquid chillers

A new line of liquid chillers consists of five standard models in capacities up to 10 hp. These chillers are designed to cool injection mold water as well as water for other operations, but have also been successfully tested in cooling other liquids. Special features include: oversize condenser, easily accessible compressor (uses Freon) with magnetic starter, self-contained liquid recirculating pump and motor. Air-cooled models have large, silent, (*To page 50*)



VIC MFG. CO. liquid chiller (back view) requires a floor space of approximately 15 square feet.

*Prices are deemed to be F.O.B. sellers' plants (unless otherwise stated), are for "standard" models, and are subject to change without notice. The publishers and editors of MODERN PLASTICS do not warrant and do not assume any responsibility whatsoever for the correctness of the same, or otherwise.



Styrene containers produced on H-400 press. Polyethylene closure produced on the versatile Van Dorn H-260.

Proved Performance

in the field by

VAN DORN model H-400 4 oz. press

Van Dorn Model H-400 press owners are reporting excellent results in their operations. For example, De Mar Products, Inc., 1317 Chesapeake Avenue, Columbus 12, Ohio, produces the styrene medical specimen containers illustrated with a *hot runner mold.* De Mar management says the Van Dorn press provides fast, dependable, fully automatic production.

This operation is a typical example of Van Dorn's unique "Package Service" for customers.

De Mar had a well conceived idea for a plastic part, but no experience in molding. They came to Van Dorn, whose engineers helped them procure a well-designed mold from a competent mold maker, and then checked the operation of the finished mold in the Van Dorn factory at no charge.

Such Van Dorn "Package Service" insures satisfaction, helps produce profits. *It is available to you also.*

Write for folder on Model H-400 Press

The Van Dorn IRON WORKS CO.

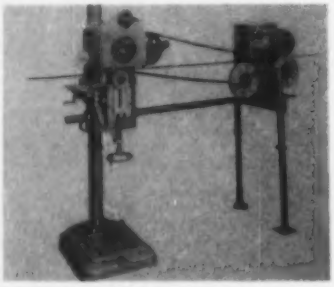
MACHINERY AND EQUIPMENT

(*From page 48*)

slow-speed fan. Temperature of chilled liquid is thermostatically controlled to within 3° F. Floor space required is about 15 square feet. *Industrial Products Div., Vic Mfg. Co., 1313 Hawthorne Ave., Minneapolis 3, Minn.*

Wire marker

The Acromark automatic footage imprinting machine consists of two separate units: one that pulls the wire to be marked and measures the footage, and another that marks the wire with footage number and trade or code marks. The numbering head



ACROMARK footage imprinting machine can handle cable ranging from ⅛- to 3-in. diameter.

has a rotating, barrel-type numbering machine that consecutively numbers every second foot on an extruded wire, up to 100,000 feet. Cables from ⅛ to 3 in. in diameter can be marked, at speeds up to 300 ft./min. Accuracy of the driving/measuring unit is said to be better than 0.5 percent. *The Acromark Co., 5-15 Morrell St., Elizabeth, N. J.*

Injection-blow molder

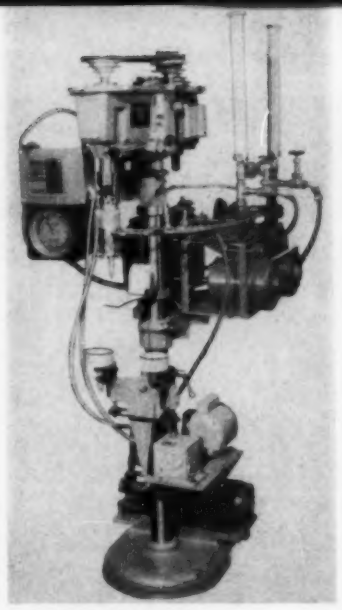
This is not only the first blow-molding machine to be developed and offered for general sale in the U. S., but is also the first completely automatic blow molder to come to our attention. A single operator can run a battery of these machines. The device is essentially an injection molding machine with auxiliary blow-molding equipment. The cycle is as follows: melt is injected into the cavities of the injection mold where it forms parisons around hollow spindles; the parisons are mechanically transferred to the blow mold and inflated; as they are chilled and ejected, a second set of spindles moves into the injection mold and it closes; etc. The ejected bottles, toys, etc., require no trimming or finishing. Injection capacity is 4 to 6 oz., melting rate is about 70 lb./hr., and dry-cycle time is 5.2 seconds. Top injection rate is 9.36 cu.in./sec. (with booster). Base price for the blow molder is $25,000. Typical tooling will run to roughly $5,000. *Moslo Machinery Co., 2443 Prospect Ave., Cleveland 15, Ohio.*

Portable fibrous glass cutter

For spraying glass-resin mixes when combined with any spray gun; for a primary or supplementary source of chopped roving on mats or preforms; and for metering chopped glass fibers to a process, portable glass roving cutter weighs only 9 lb., complete with motor. It has reportedly the same size rollers and number of cutters as heavy duty preform and industrial cutters. The cutter uses drug store blades and is disassembled without tools for easy maintenance. All bearings are of the sealed ball type. No cutter loads by the motor shaft or its bearings. The unit will cut up to 5 lb. of roving per minute. $325 complete for ½-in. longer cuts; $15 extra for ¼-in. cut. *Finn and Fram, 9765 Shadow Island Dr., Sunland, Calif.*

Polyurethane foam molder

Designed particularly for the molding of small unit pieces of polyurethane foam, The Alderfer foaming machine is completely equipped with metering pumps, test containers, self-flushing, and quickly removable mixing head. Capacity range is about 100 to 1000 g./min. (0.22 to 2.2 lb./min.), but depends somewhat on materials being used. Variability in

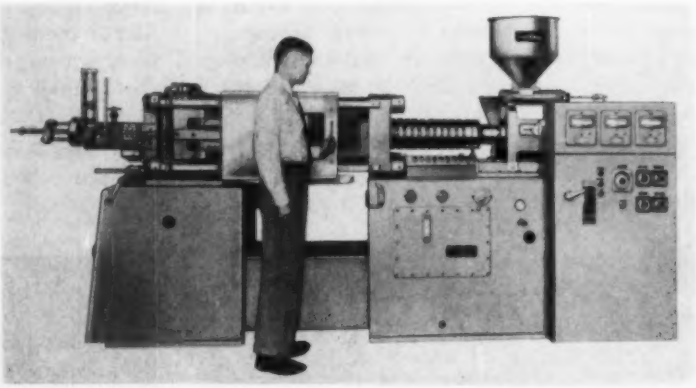


STERLING ALDERFER foaming machine incorporates metering pumps, test containers, and self-flushing as well as quickly removable mixing head.

pumping rates does not exceed 0.5 g./min. The mixing head comes apart by loosening three thumbscrews, is made of stainless steel, and can be cleaned manually or by dropping it in an acid bath. Heating units on the resin side keep the pumps warm and also warms the entire hose from resin supply to mixing head. This has made it possible to handle all the urethane foaming materials so far tried. An electric timer controls the amount delivered. Basic price is $6,250. *Sterling Alderfer Co., 3850 Granger Rd., Akron 13, Ohio.*

Small injection machine

The Model H-400, a 4-oz. automatic injection molding machine, dry-cycles in 4.3 sec. (with 6-in. stroke) and has an injection (*To page 52*)



VAN DORN Model H-400 4-oz. injection machine is designed for fully automatic operation but can also be run semi-automatically.

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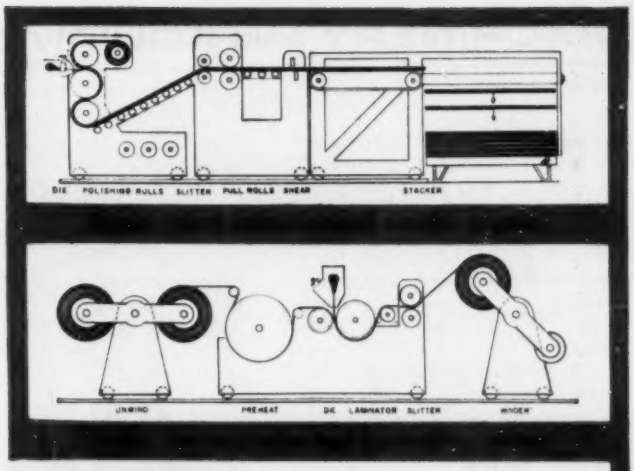

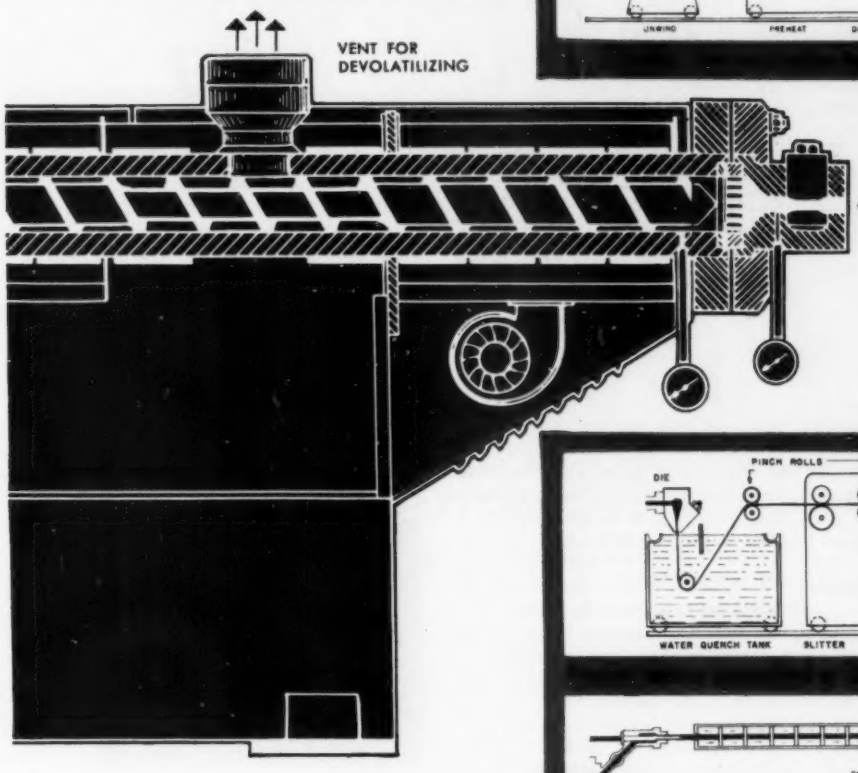

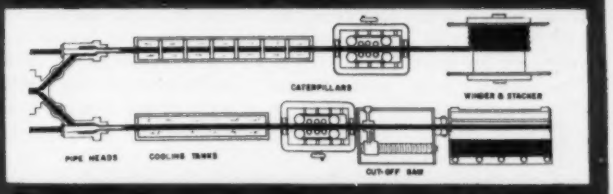

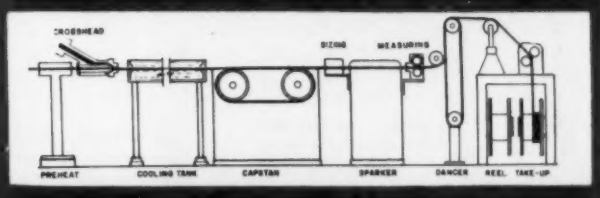

Designed for easier, more automatic operation and for faster capital return.

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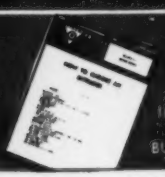
Manufacturers of Process and Extrusion Machinery

IN CANADA Barnett J. Danson & Associates, Ltd. 1917 Avenue Road Toronto 12, Canada



ASK FOR 50 PAGE ILLUSTRATED BULLETIN E-3

(*From page 50*)

plunger speed at 20,000 p.s.i. of 3 in./sec. Maximum mold dimensions are 12 by 22 in., with acceptable thicknesses ranging from 6 to 16 inches. Clamping force is 150 tons, accomplished by means of a double toggle lock; rated maximum casting area at 20,000 p.s.i. is 65 square inches. The pumps are powered by a 15-hp. motor.

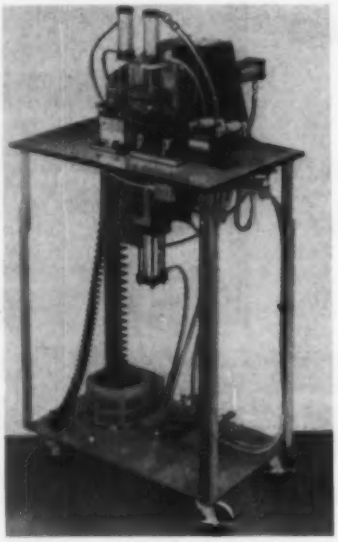
Though designed for fully automatic operation, this four-ouncer can be operated semi-automatically. Multiple feed stroking is possible, and the heating cylinder can be jacked away from the stationary platen if necessary. A Trabon one-shot lubrication system is built in. *The Van Dorn Iron Works Co., 2685 E. 79th St., Cleveland 4, Ohio.*

Splicer for rigid PVC

A machine that joins extruded rigid PVC of up to 2 by 1½-in. cross section is claimed to provide joints as strong as the extruded members. The air-operated unit completes both 90° and 180° mitre splices semi-automatically. Splices are made by controlled heating and joining of heated extrusion ends. Air-operated mold clamps hold two-piece dies made to the extrusion shape. These grip the two pieces during the complete cycle. One mold is stationary, the other slides laterally to assure alignment. A spacer plate keeps heating knife from touching the extrusion ends.

In operation an electric timer, adjustable from 0 to 1 min. by seconds, controls length of knife dwell. At the completion of the heat cycle, the knife retracts to its original position to complete the splice.

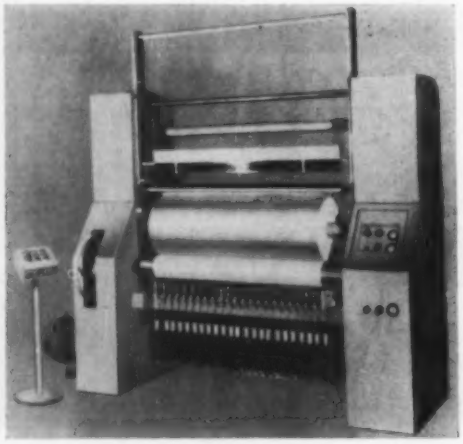
The heating element uses 110 v. 50 to 60 cycle current. The air cylinders operate from any air supply of 60 to 80 p.s.i. Table height is adjustable from 31½ to 38½ in.; required floor space is 18 by 29 inches. *The Kel-Min. Co., Middlefield, Ohio.*



KEL-MIN PVC splicer can join rigid PVC extrusion with cross sections up to 2 by 1½ inches.

Slitter-winder

Model 840 two-drum slitter and surface rewinder with top riding roll is a general purpose unit available for shear and/or score cut slitting, and can be set up for rewinding with or without cores. Speeds up to 2000 ft./min., depending on width of cut and material; minimum slit width ½ in. with single knife set-up; machine widths through 82 in., all ball bearing construction. The Model 840 can be supplied with Model 702 Templet Manifold for change-over of slit widths on score cut slitting. *John Dusenbery Co., Inc., 274 Grove Ave., Verona, N. J.*



JOHN DUSENBERY Model 840 two-drum slitter and surface rewinder provides speeds of up to 2000 ft./min.

Batch blender

Small rotary batch blenders for laboratory or pilot plant use are said to be small versions of standard production machines and feature unit construction with integral motor and controls. Models are offered in 5-, 10-, and 15-cu. ft. capacity for materials weighing up to 60 lb./cu. ft. A tilting device allows the mixer to be elevated for charging, and a disk-type discharge gate effectively seals the machine during the mixing cycle. The units are also offered with internal spray attachments for introduction of liquid additives during the mixing cycle. Optional features include quick-opening doors in the drum and flush parts for cleaning. *Munson Mill Machinery Co., Seward Ave., Utica, N. Y.*

Abrasive belt finishing tool

Adaptable to tool and die work, spot metal finishing, de-burring and de-edging, and similar work, a new abrasive belt radius-finishing hand tool weighs only about 1 lb. and can be operated from standard air motors. It develops a speed of approximately 4000 s.f.m. when driven by an air motor running at 17,000 r.p.m. The finishing tool has three usable areas: the "nose," which is adjustable for large or small radii; a long side for larger radii and convex surfaces; and the top for flat work. Oilite bearings are used on the idler shafts. $32, complete with three abrasive belts and one clamp for attaching air motor. A "Keller" model 30A17 air motor is available for an additional $80. *Peterson Tool & Manufacturing Corp., Box 513, Okemos, Mich.*—END

PETERSON TOOL abrasive belt finishing device deburrs and de-edges different radii in tool and die work.

The

NEW

PRODEX

HENSCHEL

MIXER

THE NEW PRODEX-HENSCHEL MIXER

is used successfully in many installations here and abroad to prepare compounds ready for extrusion and molding, such as: **unplasticized rigid PVC dryblend, plasticized PVC dryblend, polyethylene colorant powder mix, cellulose acetate dryblend, PVC record compound, etc.**

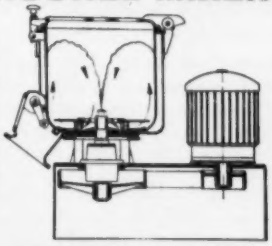
The PRODEX-HENSCHEL MIXER performs intensive dryblending and thorough dispersion of colors, pigments, fillers, stabilizers and/or plasticizers with plastics powders or granules.

It permits, if desired, the mechanical (frictional) heat-up of plastics powders faster and more uniformly than by conduction or radiation.

The unique principle of fluidizing dry powders so that they can be mixed like liquids, plus controlled shearing action, result in mixing quality and mixing speeds heretofore not obtained.

Design and Operation of the PRODEX-HENSCHEL MIXER

A cage-like ring of pins rotates concentrically around a stationary ring of pins. The rotating member also carries specially shaped blades and impellers which aerate and propel the powders to be mixed. The action is similar to that of a high-speed stirrer. The aerated powders or granules flow downward through the center of the rotating ring and pass through the zone of shearing between the rotating and stationary pins. The blend then moves upward along the wall of the mixing chamber. The entire batch rotates slowly around the axis of the mixing chamber. The rotating member of the mixing mechanism is usually operated at peripheral speeds of 100 to 200 ft/sec. The spacing between the rotating and stationary pins determines the shearing action. The shearing action controls mixing and dispersion as well as mechanical heat-up.



NEW APPLICATIONS OF THIS NEW MACHINE ARE FOUND DAILY. INVESTIGATE HOW IT COULD INCREASE THE EFFICIENCY OF YOUR PROCESS. ARRANGE FOR A DEMONSTRATION WITH YOUR MATERIAL.

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Manufacturers of Process and Extrusion Machinery

ASK FOR BULLETIN ML

U.S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

Resins. J. S. Mitchell (to Borden). U. S. 2,855,382, Oct. 7. Borated resins.

Copolymers. O. Scherer and K. H. Kahrs (to Lucius & Bruning). U. S. 2,855,383, Oct. 7. Vinyl acetate-vinyl sulfofluoride copolymers.

Resins. W. Lehmann and H. Rinke (to Bayer). U. S. 2,855,384, Oct. 7. Linear polyureas.

Polymers. T. W. Campbell (to Du Pont). U. S. 2,855,386, Oct. 7. Oxetane polymers.

Resins. G. R. Barrett, E. C. Chapin, and R. F. Smith (to Monsanto). U. S. 2,855,387-8, Oct. 7. Terpolymers.

Resins. A. Sparks (to Distillers). U. S. 2,855,389, Oct. 7. Acetone-soluble copolymers of vinylidene chloride and acrylonitrile.

Resins. W. Bunge and O. Bayer (to Bayer). U. S. 2,855,421, Oct. 7. Polyisocyanates.

Irradiation. W. C. Rainer, E. M. Redding, J. J. Hitov, A. W. Sloan, and W. D. Stewart (to W. R. Grace). U. S. 2,855,517, Oct. 7. Irradiation treatment of polyethylene.

Plastics. D. J. Shields, C. J. Kobler, and R. M. Schulken, Jr. (to Eastman Kodak). U. S. 2,856,305, Oct. 14. Cellulose ester plastics containing ultraviolet inhibitor.

Film. W. M. Wooding, Y. Jen, and E. H. Sheers (to American Cyanamid). U. S. 2,856,314, Oct. 14. Cellulose film containing melamine resin.

Polymerization. F. Grosser (to General Aniline). U. S. 2,856,338, Oct. 14. Polymerization of N-vinyllactams.

Polymers. C. W. Smith, G. B. Payne, and E. C. Shokol (to Shell). U. S. 2,856,369, Oct. 14. Polymers of epoxy-substituted esters of phosphorus acid.

Polymers. E. L. Muetterties (to Du Pont). U. S. 2,856,370, Oct. 14. Polymerizing cyclic ethers with phosphorus pentafluoride.

Resin. L. A. Mikeska (to Esso). U. S. 2,856,375, Oct. 14. Fiber-forming polyesters of bis-acetoxy methyldurene.

Copolymers. M. A. McCall and H. W. Coover, Jr. (to Eastman Kodak). U. S. 2,856,376, Oct. 14. Oxidized copolymers of ethylene and beta-propiolactone.

Resins. O. Fuchs, S. Sommer, and H. Hoyer (to Lucius & Bruning). U. S. 2,856,377, Oct. 14. Polytrifluorochloroethylene.

Resins. L. A. Lundberg (to American Cyanamid). U. S. 2,856,378, Oct. 14. Polyester resin composition containing alkyd resins.

Binder. T. J. McNaughton and H. E. Hoyt (to Borden). U. S. 2,856,381, Oct. 14. Foundry sand binder containing three phenolic resins.

Resins. S. H. Long, J. W. Tamblyn, and L. D. Moore, Jr. (to Eastman Kodak). U. S. 2,856,382-3-4-5-6, Oct. 14. Polyester resins.

Resins. H. W. Jacobson, E. L. Martin, and W. H. Sharkey (to Du Pont). U. S. 2,856,387, Oct. 14. Polyamides.

Resins. W. S. Barnhart and R. H. Wade (to Minnesota Mining). U. S. 2,856,388, Oct. 14. Perchlorofluorocarboxylic ester polymers.

Resins. J. V. Fuscoe and S. P. Mirviss (to Esso). U. S. 2,856,389, Oct. 14. Petroleum resins containing indene.

Resins. H. W. Coover, Jr. and N. H. Shearer, Jr. (to Eastman Kodak). U. S. 2,856,390, Oct. 14. Organophosphorus compounds derived from alkyl methacrylates.

Polymers. H. H. Frey (to Lucius & Bruning). U. S. 2,856,439, Oct. 14. Fluorinated polymers.

Copolymer. J. F. Wilson (to Phillips). U. S. 2,857,303, Oct. 21. Copolymer of vinylidene monomer and a polyester.

Polymerization. E. W. Lard (to Chemstrand). U. S. 2,857,322, Oct. 21. Photopolymerization of acrylonitrile.

Resins. F. C. Magne, E. L. Skau, and R. O. Feuge (to U. S.). U. S. 2,857,348, Oct. 21. Vinyl halide resins plasticized with diaceto olefin and phosphoric acid esters.

Resins. F. P. Greenspan and R. J. Gall (to Food Machinery). U. S. 2,857,349, Oct. 21. Polyvinyl resin plasticized with partially epoxidized fatty acid esters.

Resins. J. Dazzi (to Monsanto). U. S. 2,857,353, Oct. 21. Polyvinyl chloride plasticized with aspartic acid esters.

Polymers. F. C. Fang (to Du Pont). U. S. 2,857,354, Oct. 21. Glycidyl methacrylate polymers.

Composition. R. K. Iler (to Du Pont). U. S. 2,857,355, Oct. 21. Polyethylene-estersil composition.

Resin. W. M. Thomas (to American Cyanamid). U. S. 2,857,358, Oct. 21. Unsaturated polyesters containing alkyl amino styrenes as catalysts.

Compositions. S. S. Feuer (to Rohm & Haas). U. S. 2,857,360, Oct. 21. Compositions of methacrylate polymers and butadiene-styrene.

Resin. R. G. Shepherd, Jr. and E. C. Dearborn (to U. S. Testing). U. S. 2,857,362, Oct. 21. Epoxy resin.

Resin. W. K. Easley, J. K. Lawson, and J. B. Ballentine (to Chemstrand). U. S. 2,857,363, Oct. 21. Polyethylene terephthalate.

Polymerization. G. H. Berthold and R. N. Lewis (to Olin-Mathieson). U. S. 2,857,364, Oct. 21. Polymerization of caprolactam.

Copolymers. J. H. Johnson (to Monsanto). U. S. 2,857,365, Oct. 21. Olefin-maleic anhydride copolymers.

Polymers. W. J. Middleton (to Du Pont). U. S. 2,857,366, Oct. 21. Monofluoroacetylene polymers.

Polymerization. R. B. Ingraham and G. L. Gunderman (to Dow). U. S. 2,857,368, Oct. 21. Polymerization of resins for use in pastes.

Separation. E. D. Johnson (to Du Pont). U. S. 2,857,369, Oct. 21. Separation of linear polyethylene.

Resin. E. J. Lawton and A. M. Bueche (to General Electric). U. S. 2,858,259, Oct. 28. Irradiation of preformed polyamide resin.

Polymers. R. G. Bauman and H. P. Brown (to B. F. Goodrich). U. S. 2,858,281, Oct. 28. Carboxylic polymers.

Plastics. W. L. Riedeman (to Rohm & Haas). U. S. 2,858,286, Oct. 28. Plastic compositions containing carbonato esters of fatty acids.

Composition. G. H. Swart, W. C. Warner, and A. J. Beber (to General Tire). U. S. 2,858,292, Oct. 28. Vinyl resin stabilized with a trithiocarbonate. *(To page 170)*

Periodic Chart of the Atoms, Copyright W. M. Welch Mfg. Company, Chicago

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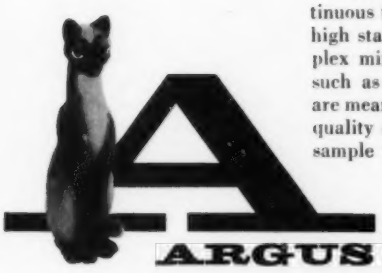

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WORLD-WIDE PLASTICS DIGEST

Abstracts from the world's literature relative to plastics. For complete articles, send requests direct to publishers. List of addresses is at end of this section.

General

Resin makers integrate. Chem. Eng. News *36*, 28-29 (Oct. 27, 1958). The strong movement of polyethylene resin manufacturers into film manufacture is discussed.

Epoxy coating methods shown. Chem. Eng. News *36*, 45-46 (Oct. 27, 1958). Epoxy coatings are described briefly.

A newcomer to the plastics industry. R. M. Richardson. Canadian Plastics *1958*, 38-40, 44, 46 (Oct.). The uses of radiation with plastics are reviewed. The different types of radiation, the various means of producing it, and the advantages and disadvantages of radiation polymerization, including graft and block copolymerization, are described. Tables of monomer and polymer reactivities are given, as well as tables describing the effects of radiation on polymers, such as crosslinking and degradation, with relative resistances indicated.

Materials

Polystyrene film. F. C. Dulmage. Modern Packaging *32*, 154-57, 226 (Sept. 1958). Unmodified polystyrene film may be subjected to controlled biaxial orientation to produce a tough, flexible packaging material. The amount of orientation is shown to be very critical with respect to its effect on subsequent physical properties. Best results were obtained by stretching about 10 times in the lengthwise direction and nine times in the crosswise direction. The oriented films show improved physical and chemical properties, are readily adapted to commonly used packaging machinery, and are well suited for many flexible and semi-rigid packaging requirements. Cost and film yield are shown to be intermediate between polyethylene and cellophane.

New protectants for polyethylene. F. Winslow. Bell Lab. Record *36*, 319-22 (Sept. 1958). The oxidation of polyethylene results in a lowering of the dielectric strength and embrittlement of the plastic. Photo oxidation can be reduced by dispersing carbon black in the plastic. However, carbon black absorbs photo energy and adds to the thermal oxidation problem. Antioxidants diffuse among the polymer chains, absorb energy from excited polymer sites, and prevent chain reactions from continuing. In the course of this protective process, the antioxidant is gradually consumed. Conventional protectants lose most of their effectiveness in the presence of carbon black. Phenyl disulfide, which is not an effective antioxidant when used alone, was found to have a remarkable degree of antioxidant activity when used with carbon black. The role of carbon black as an antioxidant is being re-examined, as it now appears that these particles themselves are able to check oxidation in its early stages.

Effect of plasticizer on the properties of polyvinyl chloride. IV. Compatibility, volatility of plasticizers, and general conclusions. Sh. L. Lel'chuk and V. I. Sedlis. Zhur. Priklad. Khim. *31*, 887-91 (1958). The compatibility of various plasticizers with polyvinyl chloride was determined by five different methods which were all in good agreement. The plasticizers, in order of decreasing compatibility, were: diethyl phthalate, tritolyl phthalate, dibutyl adipate, dibutyl phthalate, dioctyl phthalate, dibutyl sebacate, dioctyl adipate, and dioctyl sebacate.

Molding and fabricating

Types of electrodes used for HF welding of PVC sheeting. The guillotine edge. K. Brandenburger. Kunststoffe *48*, 491-94 (Oct. 1958). The appearance of a high frequency welded seam in polyvinyl chloride sheeting is governed by the nature of the lower edge of the electrode. Various types of electrode are described and the arrangement of the guillotine edge is discussed. Other factors considered include welding pressure and the support used during welding.

Removal of flash from mass produced moldings. H. Derigs. Kunststoffe *48*, 489-91 (Oct. 1958). A new method of removing flash from fragile moldings produced from thermosetting material is described. The method uses a converted drum polishing machine in which the moldings are clamped. The number of rejects is thereby considerably reduced. The method is illustrated by an actual example in which the practicability of the new method is demonstrated.

Best recipe for casting urethane. H. Gerstin. Product Eng. *29*, 86-8 (Nov. 10, 1958). Design factors for polyurethane foam castings are discussed. Cavity wall design is dependent on the chemical and physical nature of the foaming process. Thin-walled molds are preheated to prevent too rapid dissipation of heat from the exothermic polymerization, which would result in irregular skin. Pressures are built up by the carbon dioxide and the cavity must be stiffened to retain tolerances. Bleed holes are required to obtain uniform density and the size and placement of these holes are critical. Shrinkage is slight in structures of low density. Molds must be treated with a wax-type parting agent or lined with polyethylene or cellophane sheet. For a special surface on a cast part, the surfacing material can be sprayed or vacuum-formed on the mold before the polyurethane is poured.

Neck-in problem in polyethylene extrusion coating and film casting. D. Lewis and W. F. McDonald. Plastics Tech. *4*, 918-19, 927 (Oct. 1958). Problems involved in extrusion coating and film casting with polyethylene are discussed. Best results are obtained with a compromise between neck-in and draw-down.

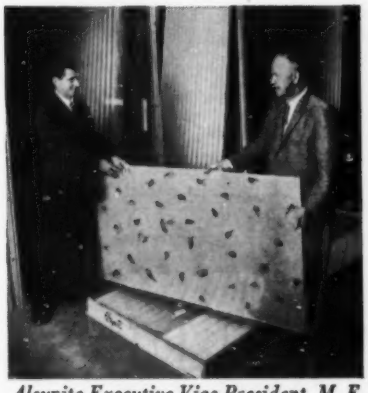
Applications

Foamed epoxy resin. A. G. Winifield. Modern Castings *34*, 104 (Oct. 1958). The suitability of foamed epoxy resin for patternmaking is discussed. The material is a strong light-weight substitute for wood with exceptional dimensional stability and resistance to attack by acids, alkalies, and solvents. It can be carved or machined in any direction, leaving a good surface. Pieces can be joined with epoxy or polyester cements. These cements can also be used to fill cellular cavities on surface. Post-cured material can be heated to 300° F. as well as compressed at that same temperature *(To page 165)*

POLYLITE POLYESTER RESIN MEETS ALSYNITE UNIFORMITY STANDARDS— FROM BATCH TO BATCH

San Diego, Calif.—In extensive tests conducted by the Alsynite Company of America, manufacturers of reinforced plastic building panels, Reichhold POLYLITE Polyester Resins have met high standards for quality and uniformity.

Commenting on POLYLITE's test and production performance, F. X. Ambrose, Alsynite vice president for manufacturing development, said, "The resin we use must be adaptable to our specific processing methods — including such considerations as storage stability, properly controlled reactivity with the various catalysts and the highest degree of uniformity from batch to batch. Production records indicate that RCI resins have never let us down in the 3½ years we have been using them ... good justification, we think, for our confidence and continued association."



Alsynite Executive Vice President, M. F. McNeil, right, and RCI's Robert Swisher, District Sales Manager—Plastics, admire a finished Alsynite panel.

Pictured here is Alsynite employee, E. Alvarado, making sure that the glass fiber is properly impregnated with RCI POLYLITE *Resin.*

SCHEDULED DELIVERY

Alsynite, oldest and largest manufacturer in the field, uses extensive quantities of RCI POLYLITE Resins. A steady supply is assured Alsynite's three plants by fleets of 4,000-gallon tank trailers based at Reichhold plants in Azusa, Calif.; Detroit, Mich.; and Elizabeth, N. J. Regular, scheduled deliveries are made every two weeks, and the resin is stored for future use by Alsynite in 5,000-gallon outdoor, insulated storage tanks.

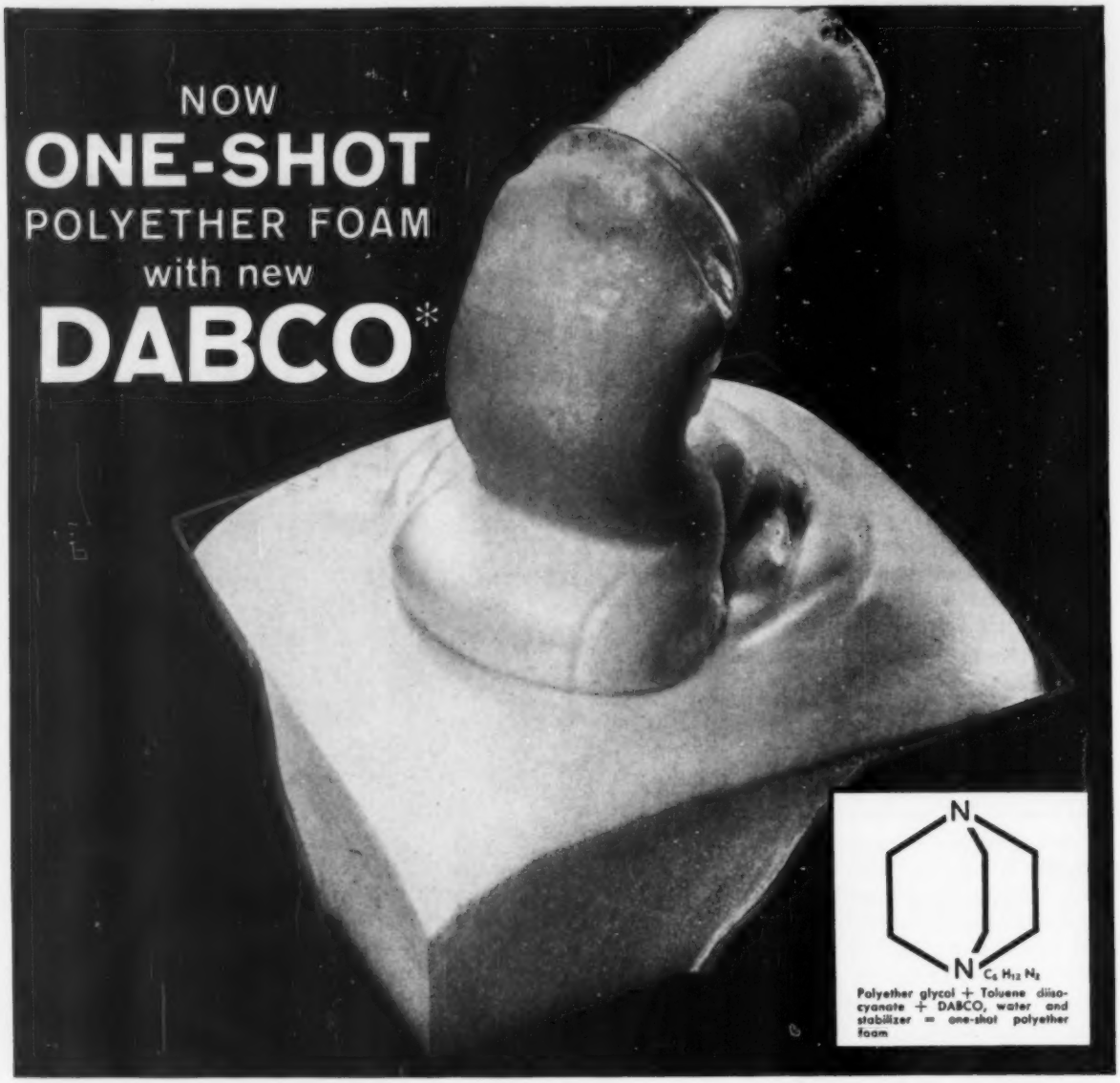
LEADER IN THE FIELD

In testifying to Reichhold's paramount position in polyester resins, Mr. Ambrose pointed out that the panels Alsynite produces must have outstanding color stability and high weather resistance ... and "our tests have consistently indicated that in insuring these properties, RCI polyester resins are among the tops in the industry."

COMPLETE RESIN LINE

If you are involved in production of glass reinforced plastics of any kind, you should investigate the complete line of RCI POLYLITE Polyester Resins — including fast curing lay-up resins, gel coats for spray, brush or roller application and any number of versatile general purpose polyester resins.

For further information and technical data write Reichhold for *Booklet B*. Reichhold Chemicals, Inc., White Plains, New York.



Now, you can produce odorless, flexible, semi-rigid or rigid urethane foams from all commercial urethane grade polyols . . . *in one simple, economical operation.* New DABCO gives you these production advantages:

- Fast cure • Prepolymer step eliminated
- Process in existing equipment
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DABCO produces foams with such good physical properties as:

- Low compression set • Uniform cell structure
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- Good molding characteristics • No odor

DABCO is now used commercially here and abroad to produce polyether prepolymer and adipic acid ester type crash pads and polyether prepolymer and dimer acid ester foams for seating and load-bearing applications. Other fields are being explored for new DABCO, for which your inquiries are invited.

Write for complete information.

*HOUDRY PROCESS CORPORATION TRADEMARK FOR TRIETHYLENEDIAMINE

The structure and properties of DABCO suggest the following other possible areas of interest:

- Chain transfer agent in radical catalyzed polymerizations
- Activator for peroxide catalyzed polymerization
- Transesterification and cyanoethylation catalyst
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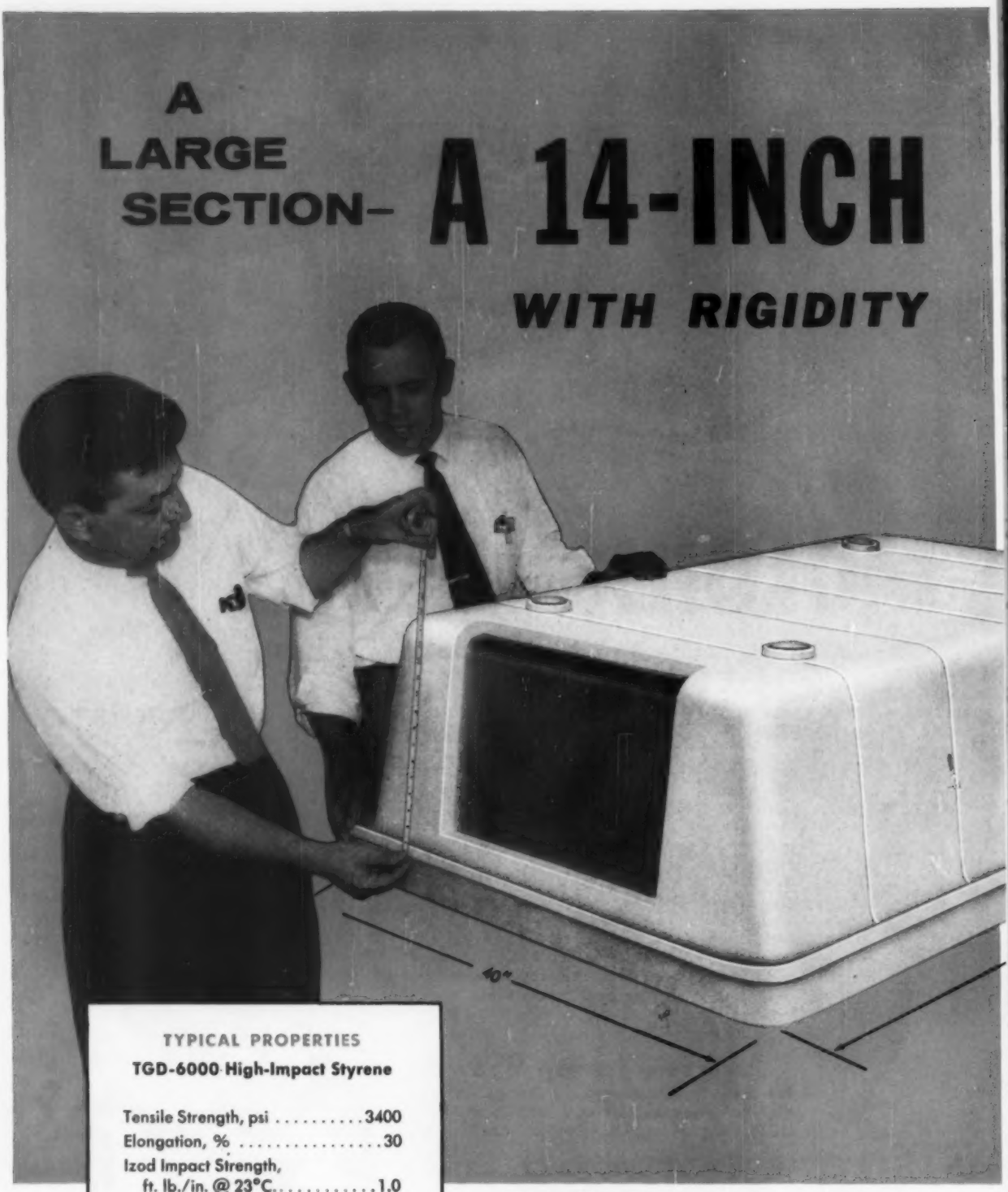

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Tensile Strength, psi	3400
Elongation, %	30
Izod Impact Strength, ft. lb./in. @ 23°C.	1.0
@ 0°C.	0.85
Modulus of Elasticity in Flexure, psi x 10^5	3.6
Flexural Strength, psi	8000
Hardness, Durometer, D	80

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A 30% saving (over former materials) was an immediate result of Almor's change to BAKELITE Brand TGD-6000 high-impact styrene. This change followed extensive tests which proved that the large table sections could be vacuum-formed directly from sheets 38½" x 58" x 125 mil., with virtually no loss in strength and rigidity, *even when deep-drawn to 14 inches!*

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For technical data on TGD-6000 or any of the other BAKELITE Brand Styrenes, contact your Technical Representative or write Dept. CC-37H.

Completed "Almor" display table for large super-markets consists of a 3-inch tray top and a 14-inch deep base, both vacuum formed of BAKELITE Brand TGD-6000 Styrene. The 14-inch draw is done with a plug assist. Kal Plastics, Beaverton, Michigan extruded the sheet of BAKELITE Brand TGD-6000 Styrene which was vacuum formed by Imperial Industries, Wayne, Michigan. Table designed by Irving Stollman.

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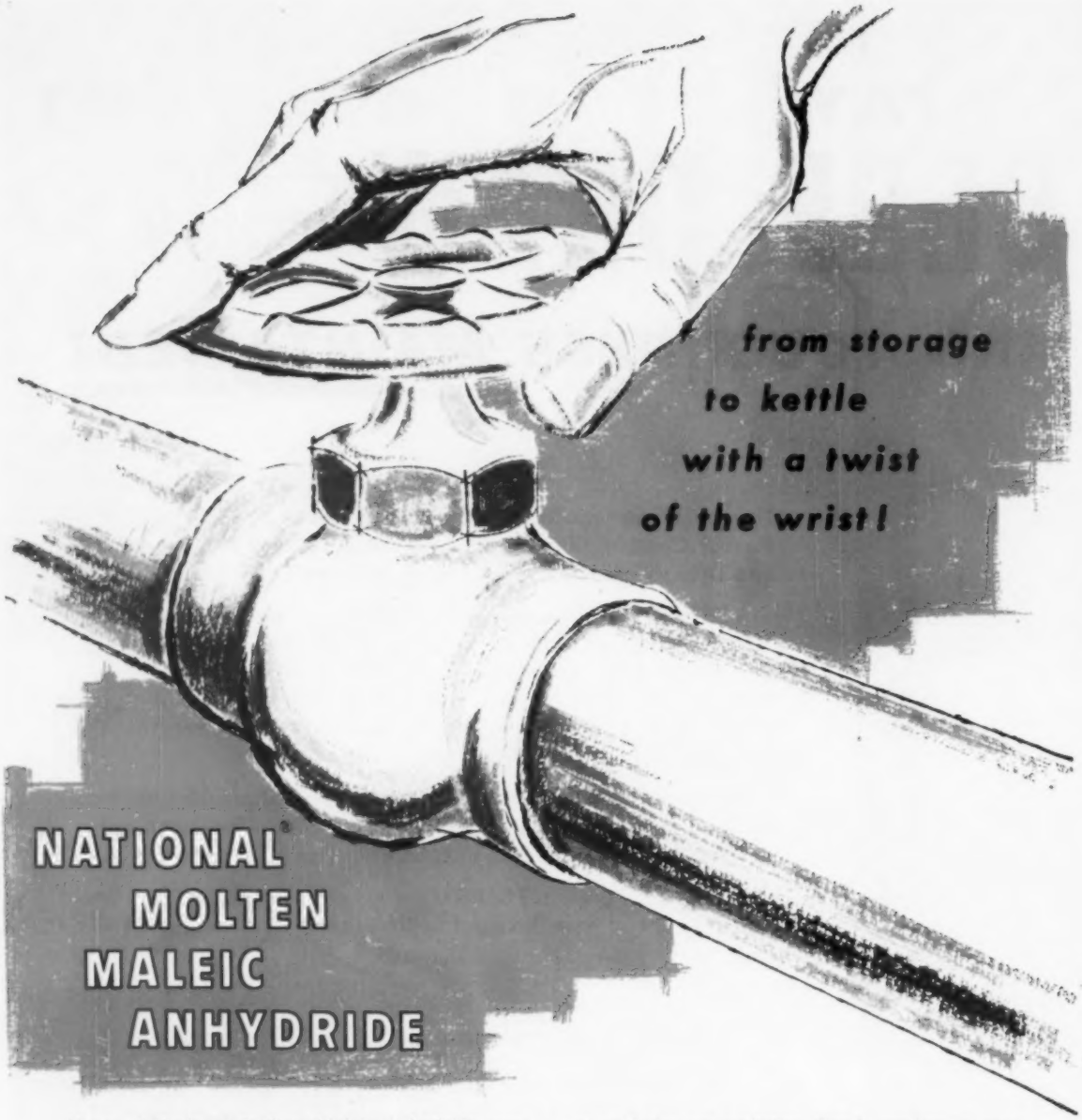

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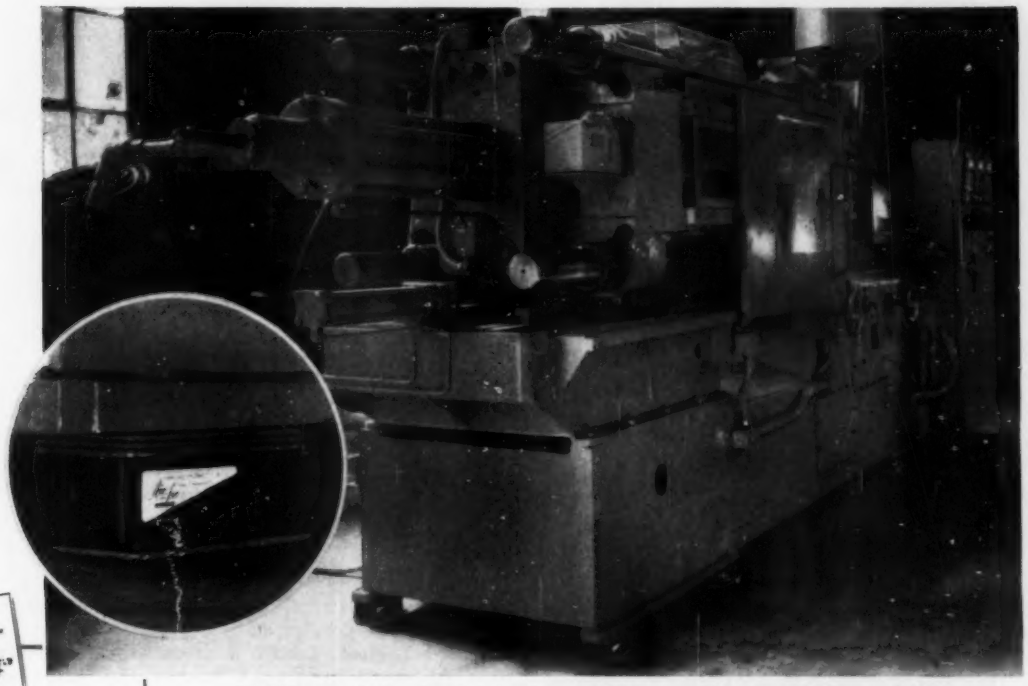

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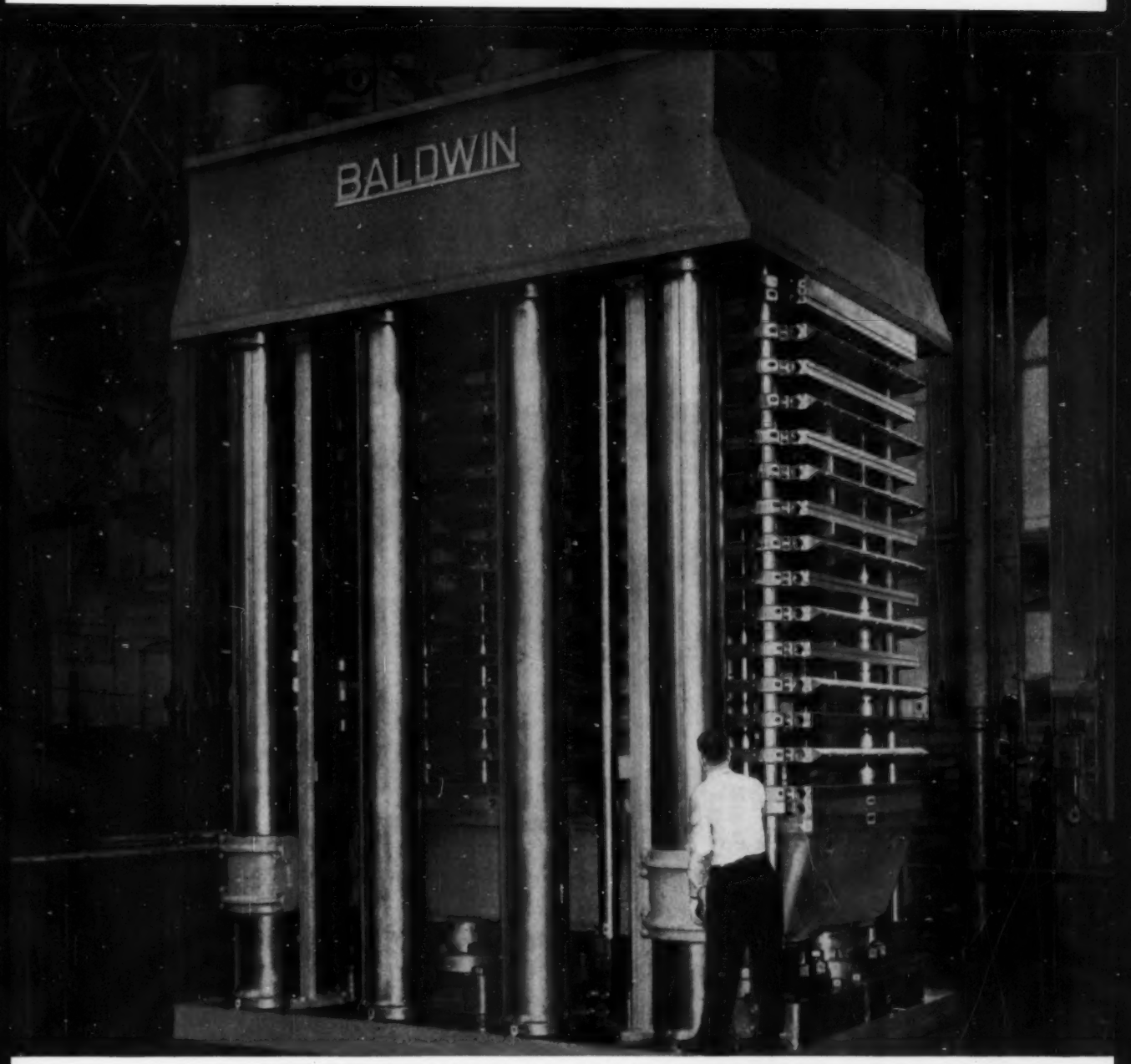

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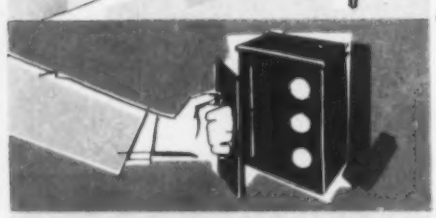

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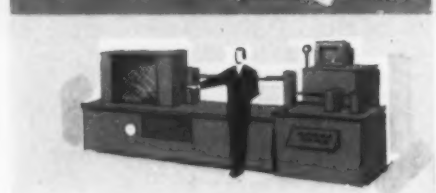

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which cuts down-time and rejects.

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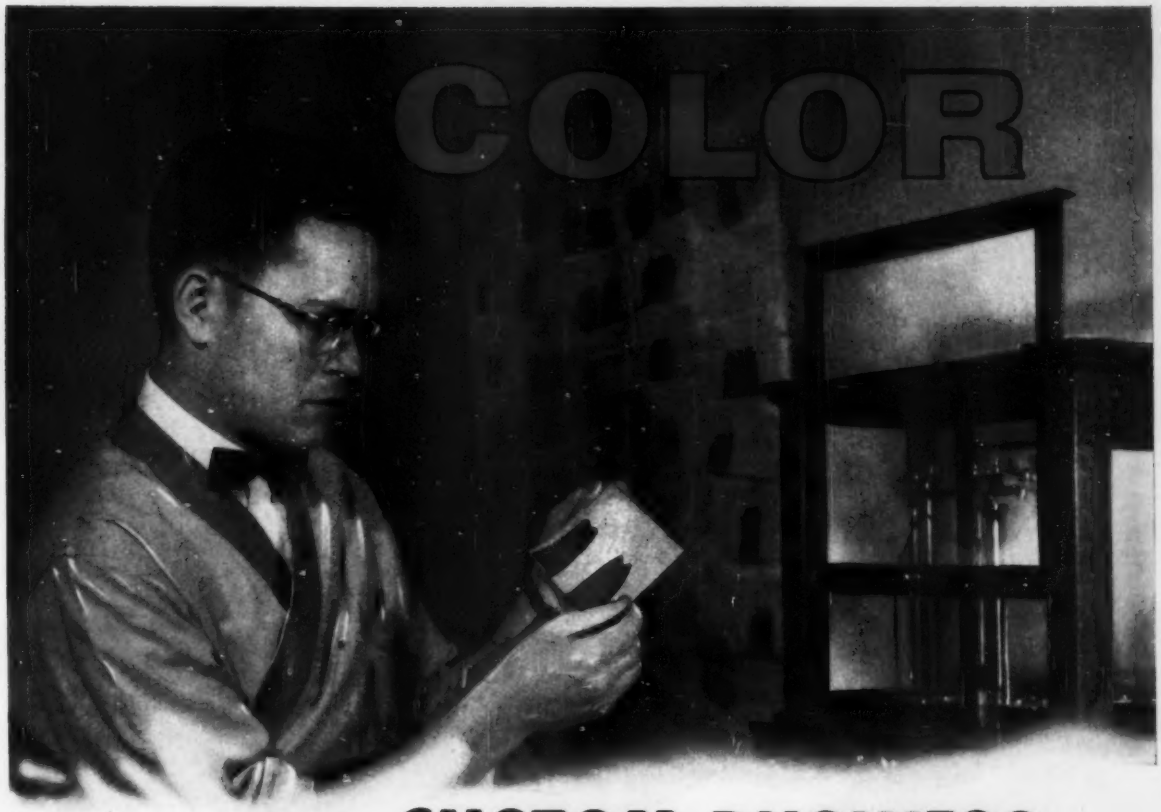

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● PEC - *in Polyester Vehicle*

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● GPE - *Ground Polyethylene*

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● MBS - *in Plasticized Resin Latex*

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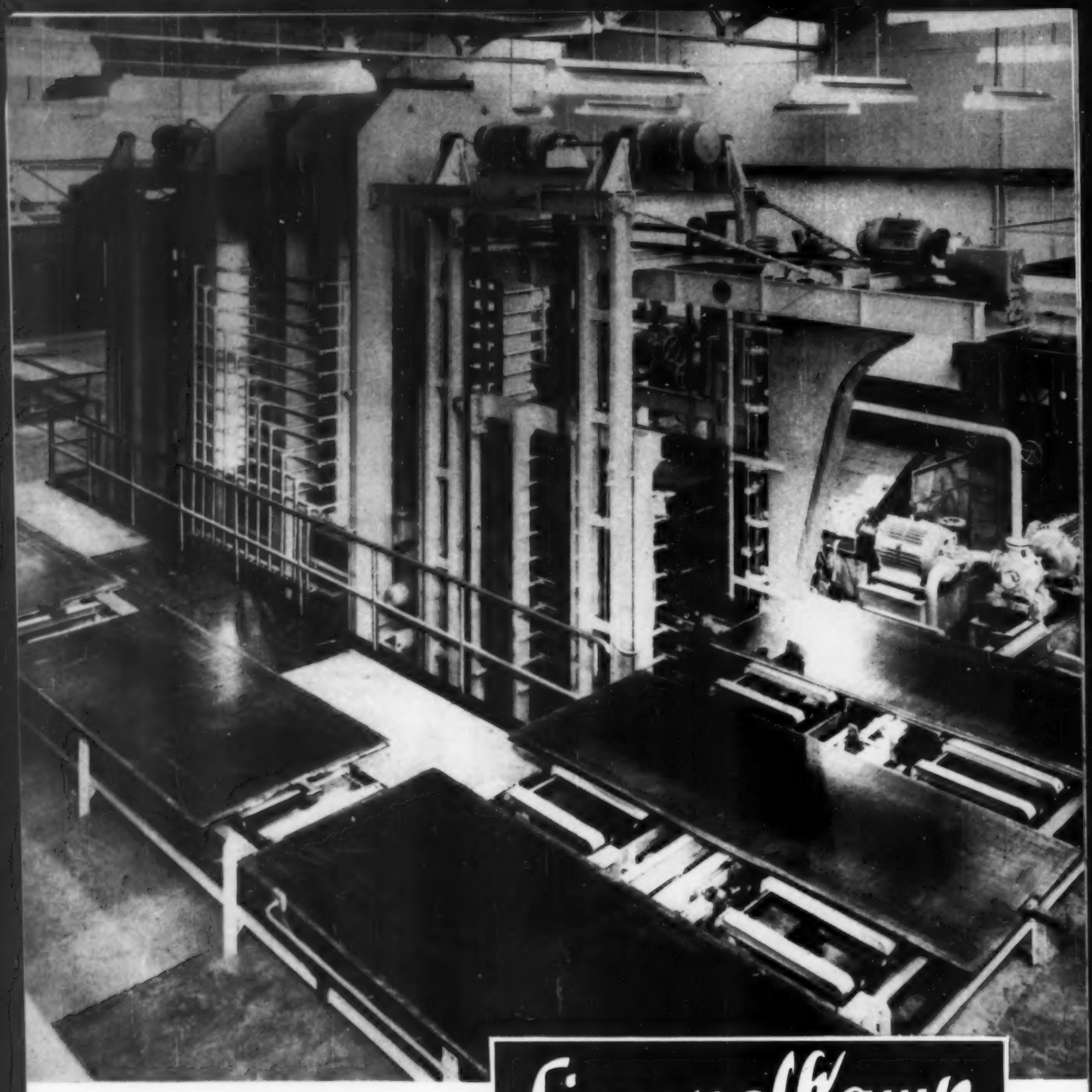

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Special hydraulic presses

for the plastics industry
for any pressure and temperature
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THAN ANY OTHER PLASTIC!

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from **BORG-WARNER**

CYCOLAC OFFERS ALL OF THESE ADVANTAGES!

- ★ Superior Impact Strength—even at Low Temperatures
- ★ Rigidity — even at High Temperatures
- ★ Hard, Glossy Surface
- ★ Corrosion, Stain Resistance
- ★ Wide Range of Colors
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- ★ Outstanding Performance

Cycolac offers you advantages that cannot be equaled today! Its quality and performance far out-ranges the field. Does your product demand rigidity? Investigate the wall thickness required by other plastics—then compare Cycolac. Must it withstand shock, abuse, rugged use? Do you need sparkling colors and hard glossy surface—corrosion resistance and less overall weight? Cycolac combines *all* of these properties—and more! Before you start a new product or make a design change, look into Cycolac.

CYCOLAC . . . *the* NEW *dimension in design*
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Write for complete technical information!

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SYNTHETIC RESINS

DIVISION of BORG-WARNER
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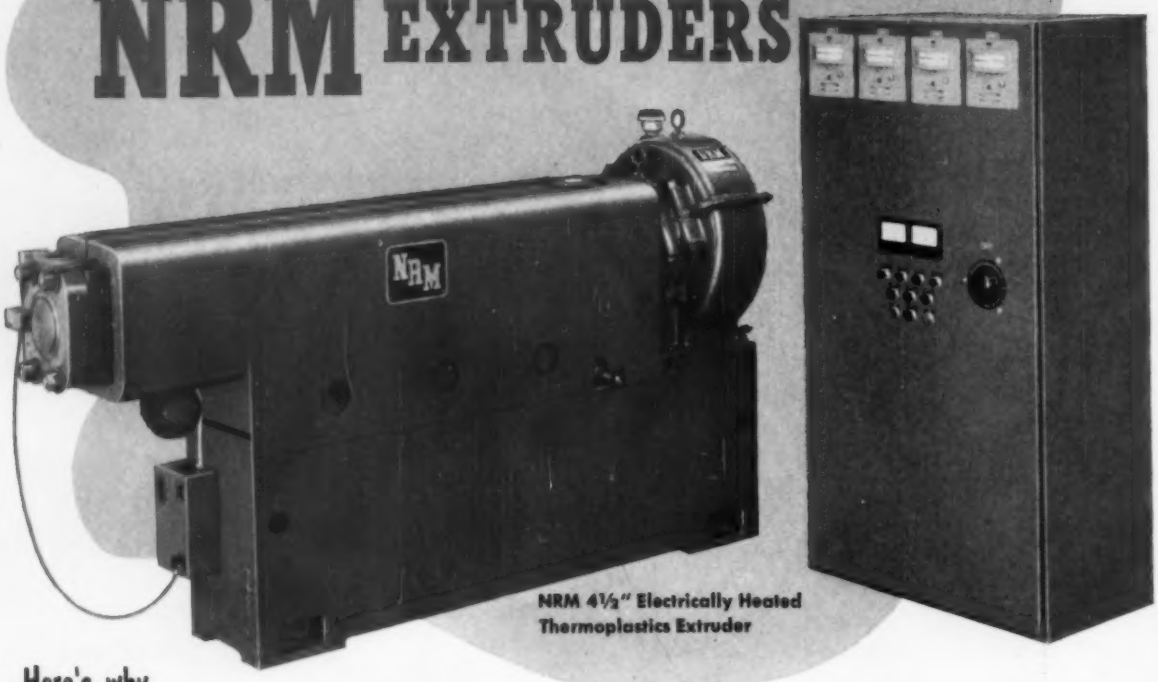
THERE'S MORE PROFIT ON PLASTICS EXTRUSION WITH NRM EXTRUDERS



NRM 4½" Electrically Heated Thermoplastics Extruder

Here's why...

1—**HIGH PRODUCTION RATES**—Size for size, NRM Thermoplastics Extruders produce more pounds per hour of **high quality, close tolerance extrusions** than other makes.

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3—**EASIER OPERATION**—NRM Extruders require less attention from the operator, due to **dependable** controls that provide more automatic operation. Smaller crews can handle more NRM Extruders.

4—**LONG WORKING LIFE**—NRM Extruders are famous for **sustained** high productive life, assuring quick capital return, and providing many years of profitable operation. One of our long-standing customers recently wrote, "Our very first NRM is still producing profitably after sixteen years of continual service."

Before **you** purchase plastics extruders and equipment, consider the NRM features above, and write us today for engineering details and performance data. Take advantage of NRM Extruder superiority to increase profit margins on **your** plastics extrusion work.

2072-A

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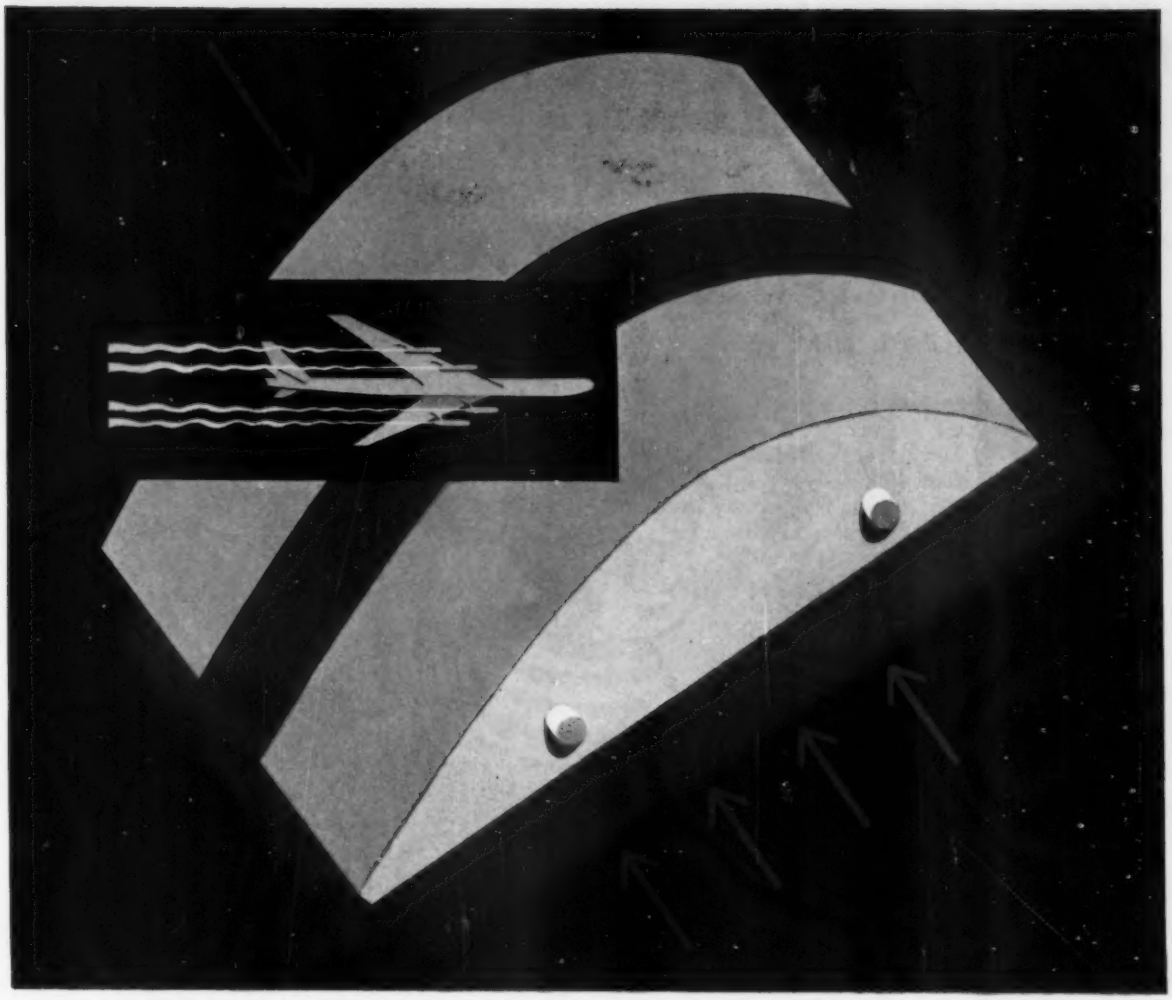
CANADIAN: F. F. Barber Machinery, Ltd., 187 Fleet St., West, Toronto, Ont.
EXPORT: Omni Products Corporation, 460 Fourth Ave., New York, N. Y.



Save up to 30% in cost, 60% in time with **EPON® RESIN** tools and dies

Your tooling resin formulator will show you how Epon resin formulations save time and money in applications such as these:

High temperature tooling: Metal forming stretch dies that can operate at temperatures over 400°F.

Heated tools: Matched dies, with integral heating units, may be made with Epon resin formulations for rapid heat curing of laminated plastic parts.

Long-lasting metal forming tools: Castings made of formulated Epon resin, mounted in a crank press, showed no permanent deformation after 28,000 compression-shock cycles.

In addition, Epon resin formulations offer you the following advantages:

Excellent tolerance control: Little machining and handwork are required to finish Epon resin tools because of the material's excellent dimensional stability and lack of shrinkage.

Outstanding strength: Jigs and fixtures with thin cross sections can be built from Epon resin-based formulations reinforced with glass cloth. The resulting laminate has high flexural strength and excellent dimensional stability.

Easy modification: Tools and fixtures made from Epon resins may be quickly and easily modified to incorporate design changes.

CONTACT YOUR TOOLING RESIN FORMULATOR

The combination of resin formulator's skill and practical knowledge, backed by Shell Chemical's technical research and experience, has solved many important tooling problems for industry. Your own formulator specialist can help you solve yours. For a list of experienced tooling resin formulators and additional technical information, write to:

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PLASTICS AND RESINS DIVISION
50 WEST 50th STREET, NEW YORK 20, NEW YORK
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SHELL

His last nickel

Remember when you were a kid and just had to have something . . . right away . . . no matter what it cost . . . even if it took your last nickel?

Well, we confess that we ourselves have been like that for almost 38 years. We'd see a new machine, try it out, then install it, still not sure whether we'd be able to scrape enough money together to pay for it. Then we'd hear about another new machine for a different purpose. And it'd be the same story all over again.

It's funny how it worked out. Right now we're running 90 compression presses, 19 injection presses, 17 transfer presses and scores of auxiliary machines in three separate plants. As a matter of fact, we now have one of the biggest and most up-to-date molding establishments in the country. And business has grown to match.

So if you wanted to, you could say we were guilty of "childish behavior". Only thing is . . . this "kid" stuff has paid off. *And not just for ourselves, either.*

BOONTON MOLDING CO.

BOONTON, NEW JERSEY

New York Metropolitan Area—Cortlandt 7-0003
Western New York Area—Alden 7134
Connecticut Area—Woodbine 1-2109 (Tuckahoe, N. Y.)
Philadelphia Area—Pioneer 3-0315

Makers of top-selling quality toys pick MARLEX*

...for rigidity, toughness, gloss and molding accuracy!

Toy manufacturers everywhere are beginning to realize the many advantages of switching to high-quality MARLEX linear polyethylene. Toys made of MARLEX have integral color that lasts and lasts—even after years of abuse. Children are protected against irritations because MARLEX is nonallergenic. Toys of MARLEX are easy to keep clean. They can be wiped with a sponge, washed in dishwashers, or even sterilized in boiling water. Toys made of MARLEX are tough, attractive and durable.

No other material serves so well and so economically in so many different applications. How can MARLEX serve you?

*MARLEX is a trademark for Phillips family of olefin polymers.

Child Guidance Toys picked MARLEX because of its excellent rigidity, toughness, gloss and molding accuracy. Their new Spinning Fan, Steam Iron and Mechanics Bench are excellent examples of colorful, durable, intricately molded toys that can be profitably made with MARLEX resin. The fan, for example, features self-lubricating MARLEX bevel gears.

This toy sports car and fire truck have numerous parts made of MARLEX...the tough, stiff, unbreakable roof, grille and bumper units, the fire ladder, and the self-lubricating cam mechanism. Trimold, Inc., Buffalo, N. Y., who molds these items for Fisher-Price Toys, says, "Color won't bleed into MARLEX from adjacent painted wood parts because MARLEX is impermeable."

Fun for young and old... the "Jeri Wheel" is molded by Arrow Plastic Molders of Inglewood, Calif. for the Original Jeri Wheel Co. This modern version of an old standby has removable metal weights for changing rolling action. Because it's made of MARLEX, the "Jeri Wheel" won't mar floors. MARLEX is unbreakable . . . nonallergenic . . . safe for children.

PHILLIPS CHEMICAL COMPANY, Bartlesville, Oklahoma

A subsidiary of Phillips Petroleum Company

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GEneva 4-7600	Digby 4-3480	FRanklin 6-4126	TErrace 4-6600	RYan 1-6997	EMerson 8-1358	Digby 4-3480

MARLEX

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BIPEL COMPRESSION-TRANSFER PRESSES

Dozens of American installations testify to the fast-growing demand for BIPEL equipment. Compression-Transfer Presses, like these, offer the utmost in fast production, economy and dependability. Individual or multiple units with central drive systems . . . fully or semi-automatic, or manual control . . . a wide selection of speeds, capacities and pressures.

The selection of BIPEL fast-acting Compression-Transfer Presses has been widened to include 8 variable pressure ranges from 24 to 660 tons maximum pressure . Thus there is a BIPEL press to meet most requirements. Please contact us for specific recommendations.

BIPEL SERVICE FACILITIES are maintained at Tiverton, R. I. . . . including replacement parts, and immediate services of expert technicians and consultants. Write for complete information on presses, and Horizontal Hydraulic Preformers.

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RALPH B. SYMONS ASSOCIATES, INC. 3571 MAIN ROAD, TIVERTON, R. I.

NOTABLE BEARINGS—These unique bearings are typical of the laminated products which American Brakeblok—a division of American Brake Shoe Company—makes for steel mills, for marine uses and for other industrial applications. American Brakeblok, which is one of the largest manufacturers of friction materials in the United States, fabricates these bearings from materials which are impregnated with phenolic resins. The materials themselves can be formed into finished or semi-finished shapes, and even bonded to metal. They can be machined to extremely close tolerances. Marketed under the brand name of A-B-K, one of their primary uses is in the construction of heavy-duty, water-lubricated bearings which must be able to withstand tremendous shock loads and stresses, without peening or setting. A-B-K bearings are able to outlast metal bearings many times over. Among the materials used for the fabrication of A-B-K products is Mount Vernon Duck.

This is another example of how fabrics made by Mount Vernon Mills, Inc. and the industries they serve, are serving America. Mount Vernon engineers and its laboratory facilities are available to help you in the development of any new fabric or in the application of those already available.

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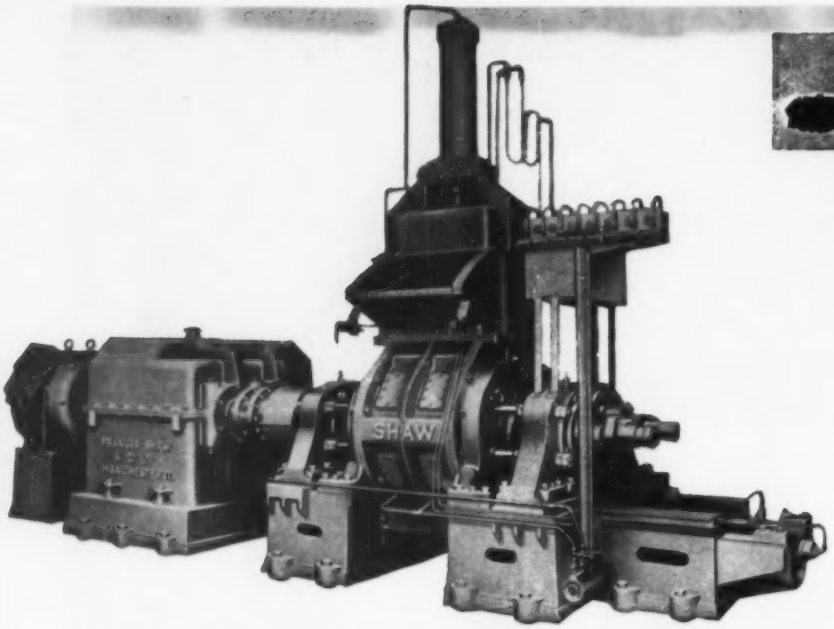

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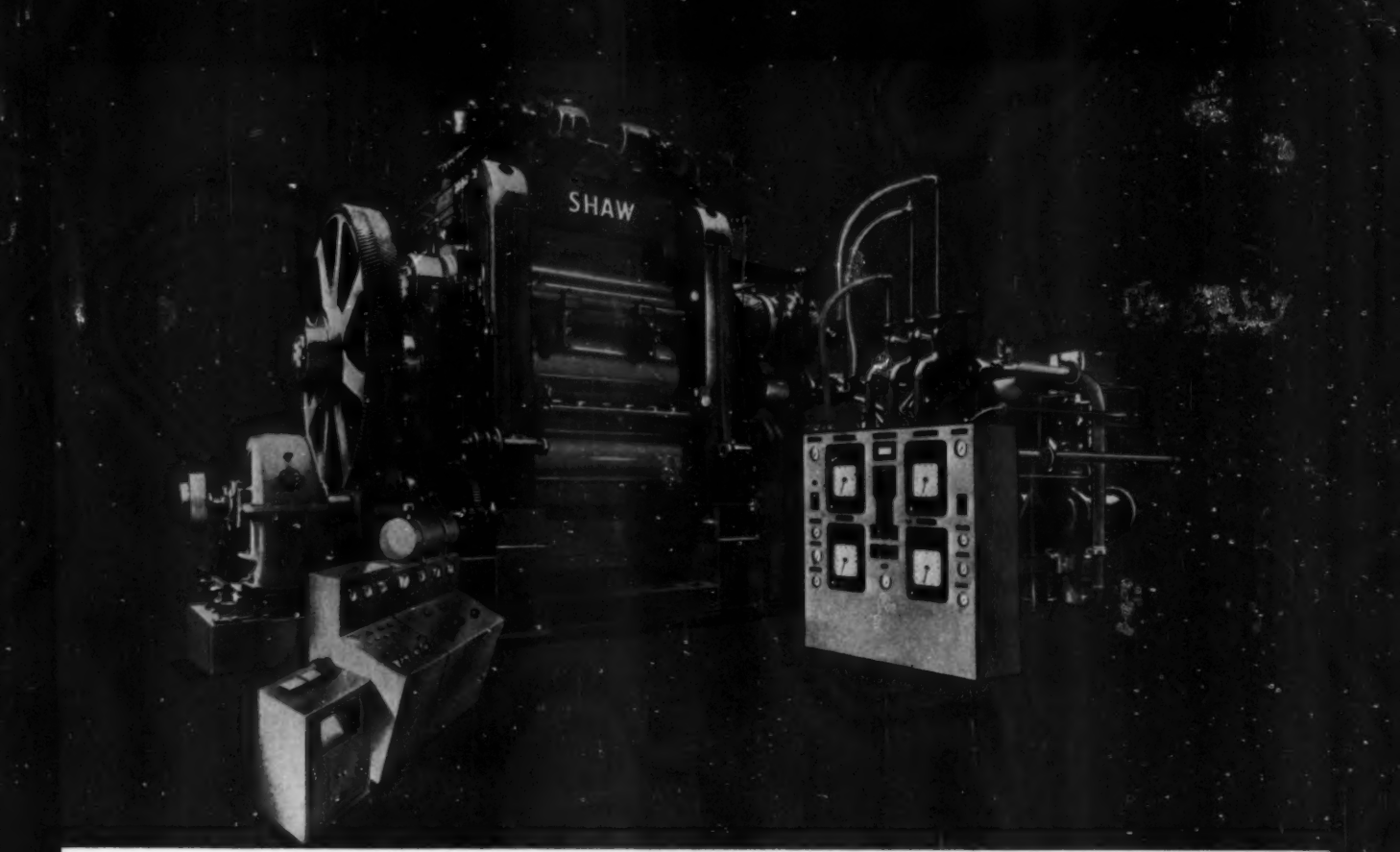
FRANCIS SHAW

quality engineering puts efficiency into Shaw machines

The cost-cutting performance of every Francis Shaw machine and its thorough dependability are the result of long experience and unvaryingly high standards of engineering in every detail of manufacture.

Close-limit accuracy and rigorous inspection during manufacture guarantee to the user a consistently high quality output from Francis Shaw equipment.

Francis Shaw are available for the design, manufacture, and installation of a wide range of processing equipment



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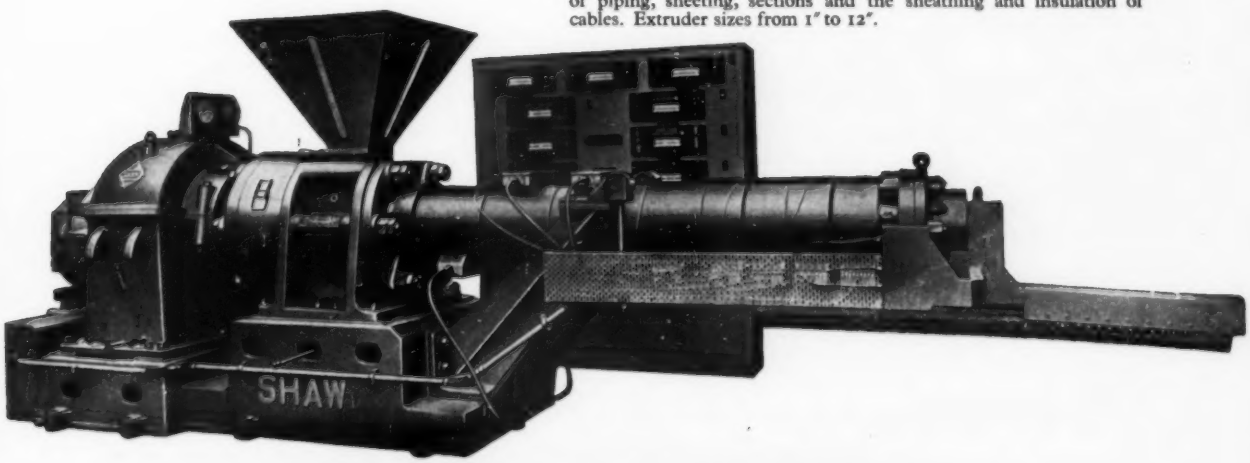
PLASTIC EXTRUDER. Fine temperature control is a vital feature of Francis Shaw extruders. All-electric heating in separate zones is provided, each zone being separately controlled by proportioning instruments. A wide range of screw and die designs is available for the production of piping, sheeting, sections and the sheathing and insulation of cables. Extruder sizes from 1″ to 12″.



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- Interleaving papers for tacky materials
- Resin-impregnated papers
- Heat-seal coated papers
- Laminations of paper, film or foil
- Polyethylene extrusions on paper, film or board

When amateurs first took to color slides, and vacationers turned to the living room wall to relive colorful moments, a stumbling block developed in the high cost of glass slide mounts. The mounts cost more than the film itself!

Why not make the mount of paper, asked a leading film manufacturer? To be successful such mounts must be strong, tough, rigid, and cleanly die-cut. Most important, they must be cheap.

Riegel researchers were called in, and asked to lend their wide experience with strong papers, plastic impregnations and coatings. After much experimentation and chemistry, the present day mount was developed. Part of the secret lay in a new heat-seal resin coating. Even though applied thinly (only 8 lbs. per 3000 sq. ft.) the coating seals quickly at temperature as low as 190 deg. F.

Riegel specializes in developing, manufacturing and converting *technical papers that solve problems.* If you have an idea for doing something in a better way . . . with a better paper . . .

Riegel

.....write to: **Technical Advisory Service**
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Box 250, New York 16, N. Y.

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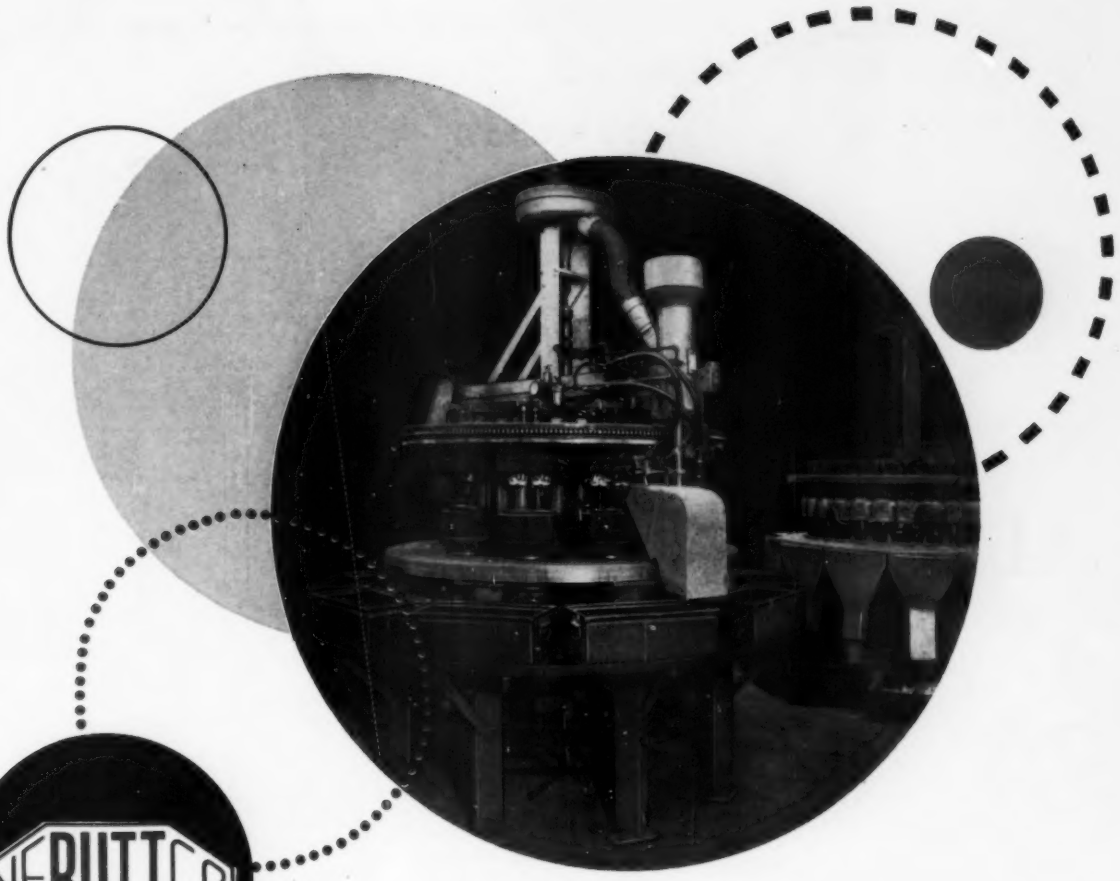

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AUTOMATIC ROTARY PLASTIC MOLDING PRESSES

10- or 30-Station Machines

- Low cost simple molds
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- Maximum flexibility
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- Hopper feed – the supply rotates
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- Adjustable temperature in mold holders
- Low cost molding for small quantities
- Molds changed without production interruption

For descriptive bulletin or opportunity to see these machines in operation, contact

NEW ENGLAND BUTT CO.

Division of Wanskuck Co.

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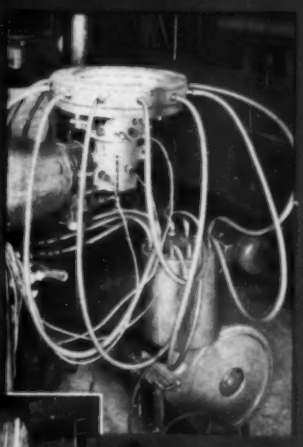
For highest quality blown film, or cast film by the chill-roll method

Packaged Film Extrusion Unit with extruding extruder, die accessories and take-off tower.



.... extrude it on a Reifenhäuser!

The use of our engineered cooling rings and air compressors results in higher quality film and increased out-put speed.

In addition to our line of extruders (1-1/4", 1-3/4", 2-1/2", 3-1/2" and 4" screw diameter) Reifenhäuser furnishes complete and automatic "packaged units" for every type of thermoplastic extrusion.

Yet, Reifenhäuser Extrusion Equipment enjoys a world-wide reputation for its superior engineering features, its dependability in extruding difficult materials, and its efficiency in operation.

Keep in step with progress by writing us today for full information on the new Reifenhäuser Extruder.

Film Take-Off Tower Features two wind-up stations with automatic tension control. Main adjustable slitters for shooting.

Casting Machine for extrusion of flat film or flat chill-roll method. Available in a 31" and 43" roll width (net), double wind-up.

Flat Film Die Heads are available for film up to 43" and wider.

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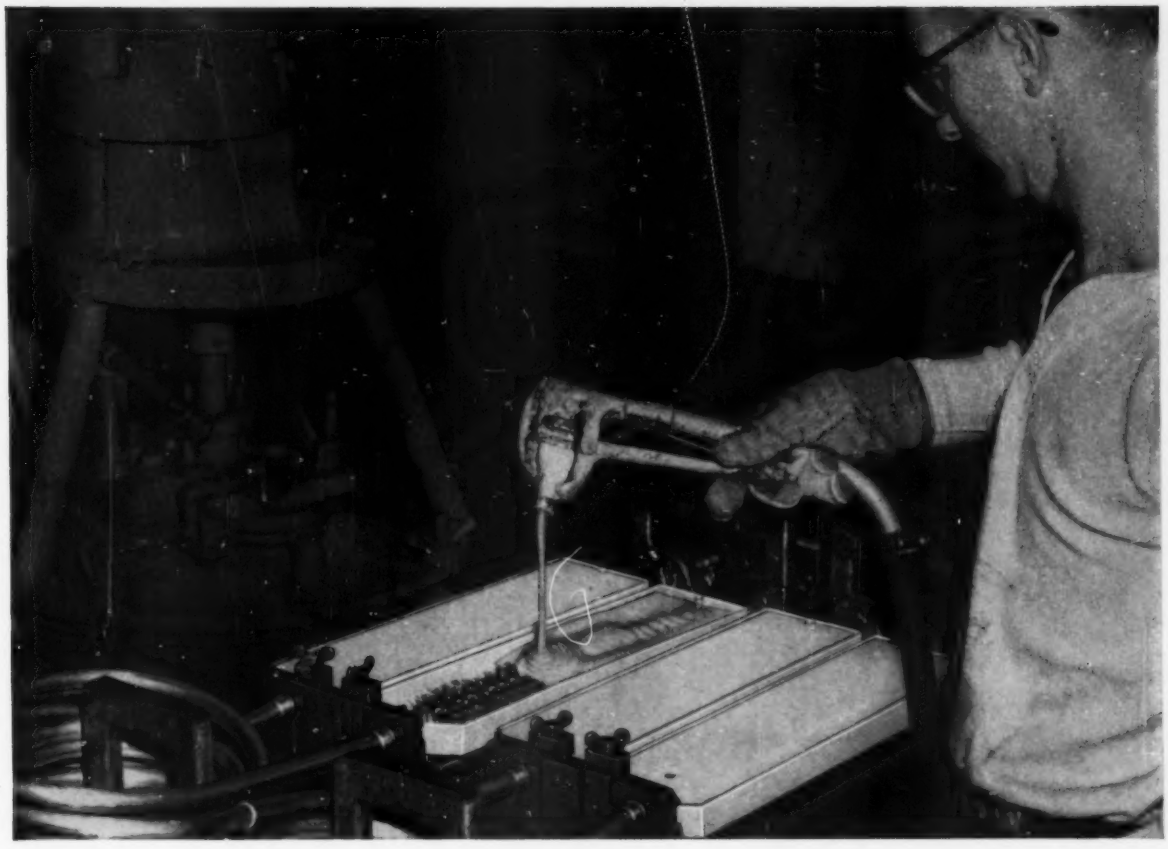

For casting and potting of products for electrical and other industries...

GLIDPOL 1008 polyester resin system produces tough castings that resist cracking!

GLIDPOL 1008 polyester resin and its modifications are ideally suited to casting and potting operations. This rigid-type, all-purpose resin is finding wide application in the manufacture of terminal blocks, coils, transistors and other electrical products. It permits hard, tough, moisture-proof castings that resist cracking during conversion. Metal, wood and paper inserts are easily imbedded in the resin.

GLIDPOL 1008 provides excellent abrasion and chemical resistance. It can easily be pigmented in a wide range of colors by the use of GLIDPOL 3000 pigmented bases. Fillers, such as talc, clay, silicas, glass floc and asbestos, may also be added to GLIDPOL 1008.

Whatever products you manufacture, you may be able to achieve faster, more economical production by using GLIDPOL polyester resins. Glidden technicians will help you select the proper resins, catalysts, colors, fillers, and in establishing correct curing schedules. Write now for complete data on GLIDPOL 1008 and GLIDPOL for other fabricating techniques.

LIQUID RESIN PROPERTIES

Viscosity @ 77° F.	800 cps.
Polyester resin content	68%
Weight per gallon	9.45 lbs.

SPI GEL TEST
(1% Benzoyl Peroxide, 180°F)

Gel time	3.1 min.
Peak time	4.5 min.
Exotherm peak	410°F
Pot life @ 77°F	30 hrs.

QUALITY Glidden PRODUCTS

GLIDPOL POLYESTER RESINS

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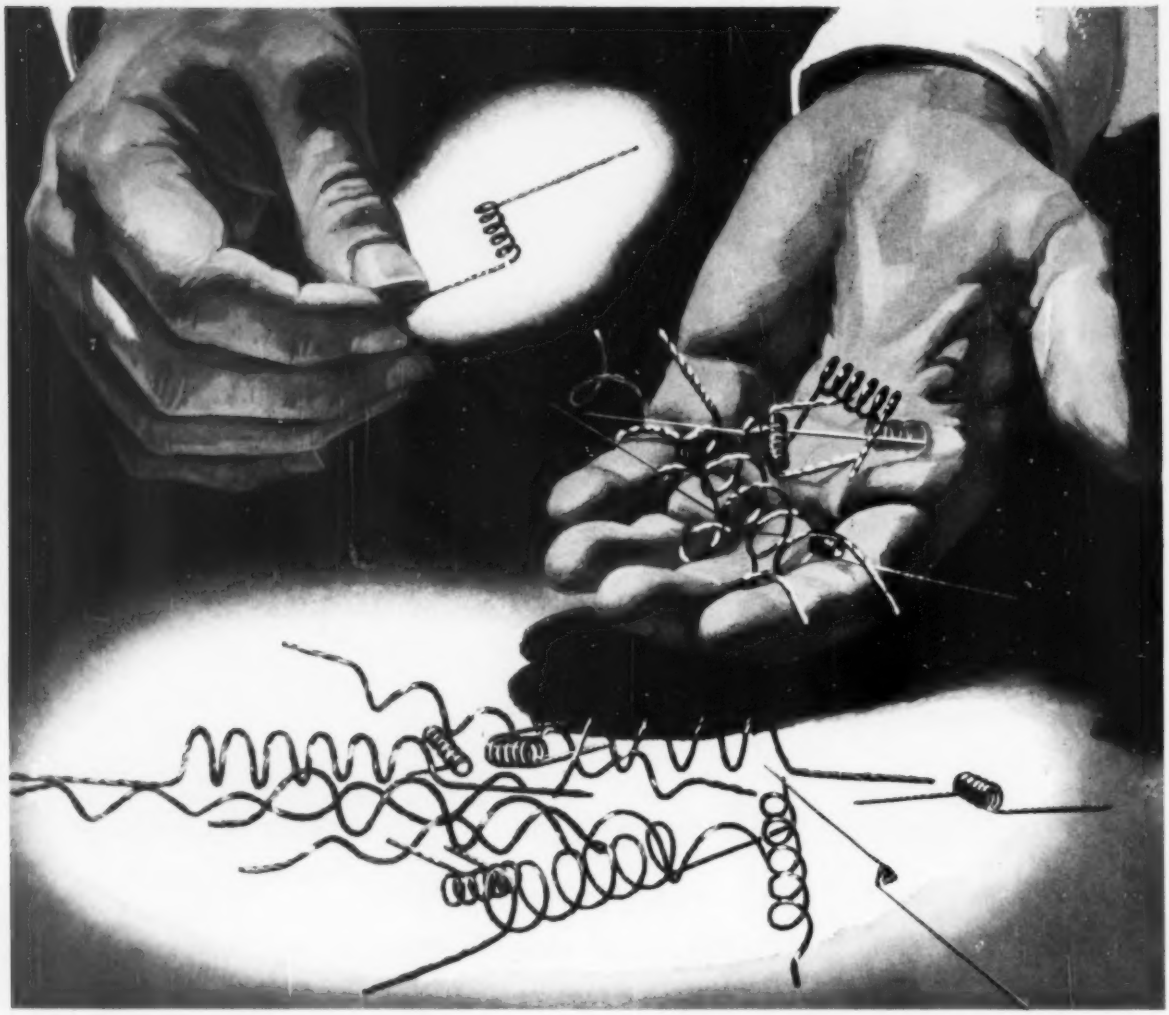

Here's how to find the one Vacuum Metallizing Coil best for you

Send for Sylvania's new coil catalog. It gives full information on the 164 standard vacuum metallizing coils made by Sylvania. If the coil you need is not listed, Sylvania engineers can design a coil to fit your specific needs. Just supply us with the following information:

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Address your coil information or request for Sylvania's new coil catalog to:

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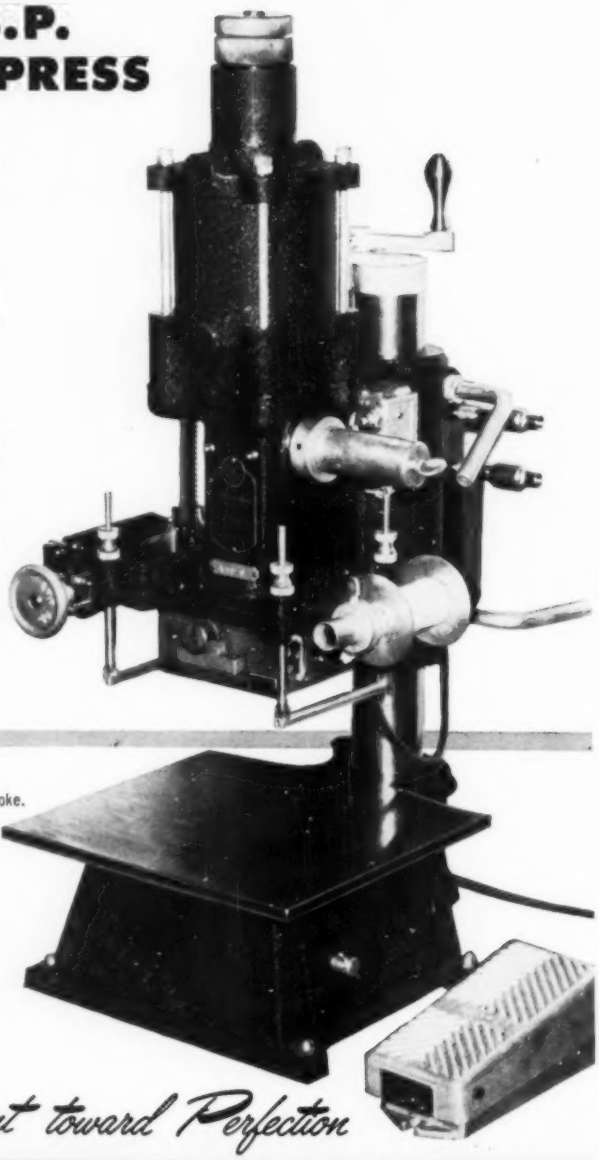
STAMPING PRESS

AIR-OPERATED MODEL A.B.P. BENCH PRESS



★ **FAST OPERATOR**

for hot stamping on cloth, paper, leather, wood, fibre, soft and hard plastics, hard rubber and most other materials. PEERLESS ROLL LEAF available in gold, imitation gold, aluminum, a wide range of pigment and metallic colors.

★ **AIR OPERATED**

Press has a built in air cylinder which is cushioned at both ends of cylinder to avoid hammer blows on work.
In addition to raising and lowering screw we have included a micrometer adjustment at top of cylinder for adjustment of impression.
Press is equipped with a timing relay for dwell control.

★ **FOOT OR HAND CONTROL**

Foot control, standard equipment, leaves operator's hands free to position articles to be stamped. Also available with hand control. Speed adjustment permits up to 40 impressions a minute, depending on articles and materials being stamped.

★ **AUTOMATIC HEAT CONTROL**

Electrical outlet built into press. Pilot light, thermometer, insure uniform temperature.

★ **AUTOMATIC ROLL FEED**

Adjustable, feeds up to 5" of leaf 4¼" wide. Side to side feed.

★ **BUILT FOR PUNISHMENT**

by Peerless, pioneers in roll leaf stamping.

SPECIFICATIONS

SIZE:
15" wide x 19" deep x 36" high. Depth of throat opening 6" from center of head. 5" maximum opening from die plate to table. 2" stroke.

STATIONARY TABLE:
12" x 11"

AIR PRESSURE:
Not less than 2 h.p. compressor — 80 lb. pressure equipped with 60 gallon tank. Compressor not supplied.
Pressure approximately 19 times line pressure.

ELECTRICAL:
110 volts A.C., unless otherwise specified.

SHIPPING WEIGHT:
220 lbs. Net, 270 lbs. Gross
Head size: 4" x 5"
Die plate size: 4" x 5"
Chase size, inside: 3" x 4"

EQUIPMENT INCLUDES:
lubricator, regulator, strainer and 6 ft. of hose.

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BRANCH OFFICES: BOSTON • CHICAGO • *Peerless Roll Leaf Division* • GANE BROS. & LANE, INC.
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DOW | Plastiatrics

DOW'S CLINICAL APPROACH TO HEALTHY PLASTICS APPLICATION

PROPER CLASSIFICATION AND USE OF DATA VITAL TO SUCCESSFUL PLASTICS PERFORMANCE

FIVE BASIC DATA TYPES DEFINED

Proper classification and use of available data is one of the most important steps in developing good plastics design and engineering data. Vast differences in the five data types as defined by Dow Technical Service engineers (see chart at bottom of page) make it imperative that care be taken to insure their correct application.

For example, identity data are normally of no value in screening, quality control, engineering or design. At the same time, quality control data should not be applied where design or engineering data are required by the problem being studied.

Generally speaking, quality control, screening and identity data fuse together into the area of *routine testing*. They are characterized by the need for speed and reliability and are often based upon test methods far removed from basic design and engineering.

Engineering and design data, on the other hand, are generally more expensive, time consuming, fundamental and of broader applicability than any other forms of data. They should not be considered in the area of routine testing, but as representing *materials engineering* in its fundamental form.

Successful research, development, production and application of new materials can be greatly hindered by the unwitting transfer of data or methods from testing into materials engineering. And yet, examples of misapplied data have occurred with enough frequency to indicate a potentially serious trouble spot in the industry.

To help combat this problem, technical service engineers at Dow are compiling comprehensive design engineering data and principles tailored for the design engineer. This data, the result of continuing studies which Dow conducts in the interests of the plastics industry, should clarify many areas of possible confusion on the use of plastics data. Future Plastiatrics articles will present this data as it is developed. THE DOW CHEMICAL COMPANY, Midland, Mich., Plastics Sales Department 2100CS3.

TYPE OF DATA	DEFINITION	EXAMPLE
DESIGN	Those data on materials which permit the design of a new item or improved design of an existing item through proper choice among materials and calculations of the size and shapes required for satisfactory performance.	The tensile strength of specimens made from a given material as a function of time, temperature and environment.
ENGINEERING	Any data relating to the intended performance of a complete item or portion of that item irrespective of the materials from which it was made.	The bursting strength of a pipe as a function of time, temperature, and environment.
QUALITY CONTROL	Any form of test data relating to predetermined levels of acceptable quality to manufacturing conditions.	The melt viscosity of a plastic under specific and prescribed test conditions.
SCREENING	Those data which rank similar products or materials in order of preference for a given characteristic regardless of specific end-use requirements.	The ranking by density of expanded plastics.
IDENTITY	Results of tests which establish the identity, grade, type, purity or composition of a product among otherwise similar products.	The detection of chlorine in polyvinylchloride (PVC).

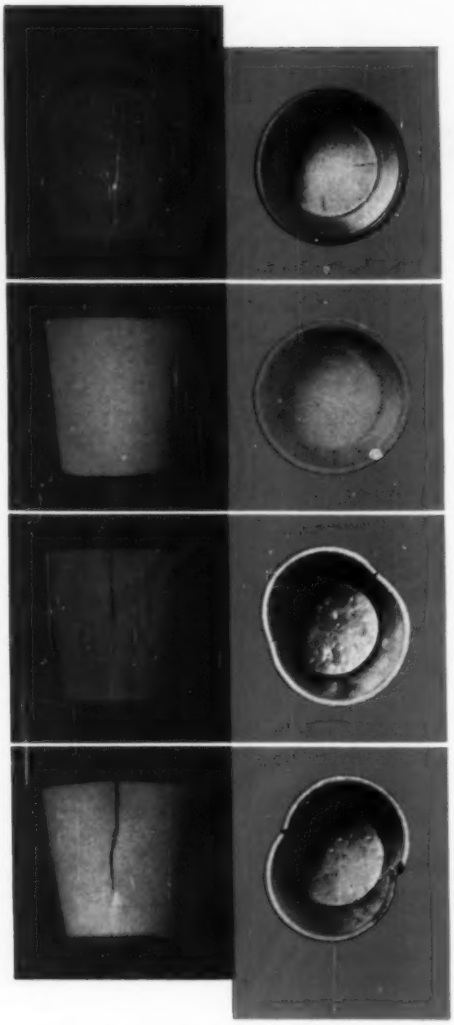
UNRETOUCHED PHOTOS

DRAMATIC PROOF ▶

of DAPON® resin's outstanding stability under heat and humidity

As graphically shown here, Dapon Resin does not distort, degrade or discolor under long exposure to high heat and humidity. This outstanding dimensional stability, coupled with Dapon Resin's high electrical properties and chemical stability even under extreme conditions, may provide the answer to your high-temperature high-humidity plastics stability problems.

Dapon Resin is easily compounded with a wide variety of mineral and fibrous fillers and has extremely low molding and post-mold shrinkage. And in addition, Dapon Resin can be molded in a range of solid and pastel colors.



MELAMINE "A"
after 10 days under test

DAPON
after 90 days under test

POLYESTER "A"
after 18 days under test

POLYESTER "B"
after 22 days under test

TEST DATA: An equal number of test cups were molded under normal conditions from commercial polyester, melamine and DAPON Resin. The cups were half filled with tap water and placed in a laboratory oven at a constant 212°F temperature, the water being replaced daily. The cups were examined at regular intervals and removed from the oven when they had reached the condition shown in the unretouched illustration.

At your request, we will be glad to send you complete technical data on Dapon Resin so that you can investigate this unusual plastic as the answer to your specific problems.

Properties of DAPON* Resin

Stable, free-flowing white powder • Easy to store, easy to mold, easy to color • Molded products have excellent surface finish • Good physical strength • Low moisture absorption • Chemically resistant • High-temperature and high-humidity resistance • Outstanding dimensional and chemical stability • Fine electrical properties even at high-temperature and high-humidity.

**DAPON Resin is the registered trade name of Food Machinery and Chemical Corporation's brand of diallyl phthalate prepolymer.*

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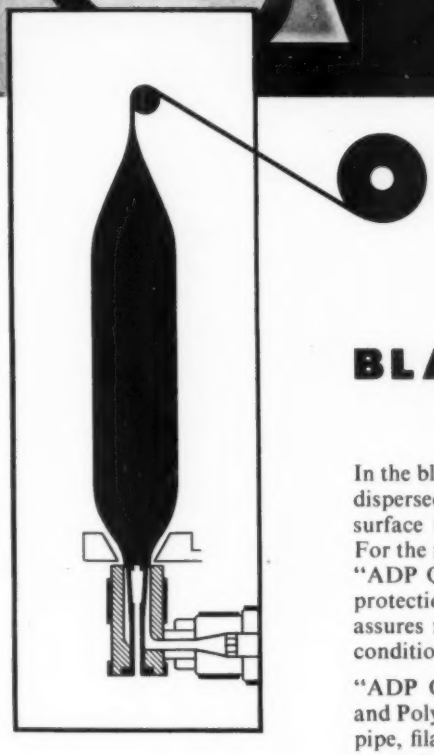

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In the blown-film extrusion of thermoplastic resins, only *completely* dispersed carbon black can assure the uniform jetness and smooth surface texture required to meet top product quality standards. For the manufacture of agricultural film and sheeting, for example, "ADP Quality" black Polyethylene concentrates give a degree of protection against deterioration from ultra violet sun rays that assures maximum serviceability under the most extreme exposure conditions.

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New Concept in Luggage

Campco Linear Polyethylene Sheet

Light-weight, rich-looking quality luggage at half the cost of conventional types is now possible with a new Campco Copolymer Linear Polyethylene sheet. The excellent physical properties of this material form into luggage that is almost indestructible in resisting the impact and abrasive wear and tear of baggage handling, extreme cold (to −180°F), moisture, mildew and chemicals.

Its high tensile and flexural strength make applications with complicated draws like forming luggage possible.

Campco Linear Polyethylene lends itself to all conventional forming techniques, machines readily and can be rapidly die-cut to size and shape. Sheets can be bonded with commercial cements or welded with heat and pressure.

Available in smooth or Haircell grain embossed finish, sheet or roll from .020 to ¼" thick. Excellent for automotive interiors, apparatus cases, housings for business machines, housewares, cabinet drawers, duct work and exhaust hoods.

Visit Campco Display

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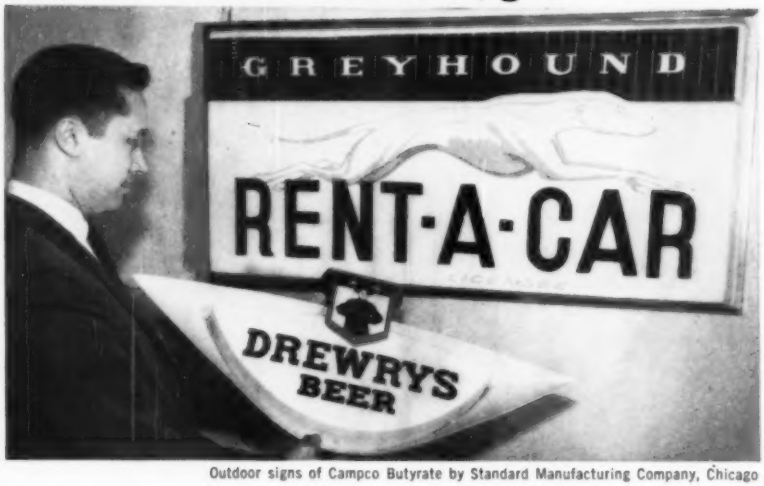
April 13 to 17, International Amphitheatre, Chicago

See the latest packaging and display applications of

Polyethylene, Acetate, Butyrate, Styrenes, Polypropylene, Nylon.

Campco Butyrate scores in weather tests, opens new vistas in outdoor signs



Outdoor signs of Campco Butyrate by Standard Manufacturing Company, Chicago

Colorful outdoor plastic signs that can withstand weather hazards without becoming brittle or losing their brilliance are now possible with a special Campco Butyrate sheet. Made from resin supplied by Eastman Chemical Products, Inc., Campco Butyrate is tough, durable, easy to form, and completely weather resistant.

Weather-test results at Arizona checking stations assure the resistance of Campco Butyrate to extremes of sunlight, rain, heat, cold, snow and wind. Moreover, its surface resists dirt build-up and washes clean in rain.

Because Campco Butyrate is strong and resilient even in thin sections, substantial savings can be effected in its application for outdoor signs. A little goes a long way. Its ease of forming opens unlimited design opportunity—imaginative shapes . . . new vistas in outdoor signs.

Campco Butyrate is available in clear crystal or a variety of colors—rolls and sheets in thicknesses .005" to .125" stock or custom size. Clarity ranges from transparent through translucent to opaque.

It's easy to decorate by either lacquer or silk-screening. Attractive combinations of bright trademarks, slogans or other wording against colored or clear background are easy to achieve

Campco Woodgrain Sheet sells "A'lure"

Handsome counter displays of Campco Woodgrain finish plastic sheet are helping to sell Warner Brothers "A'lure" bras in apparel stores throughout the country. This new Campco sheet looks like solid wood but is light as a feather, and has all the excellent qualities of standard Campco sheet . . . high impact resistance, dimensional stability and outstanding formability. Available in cut-to-size and standard sheets from .040" to .187" thick.

Received Your Campco Personal File? This data-packed reference file on thermo-plastic sheet and film is yours on request—just send name and address on Company letterhead to Campco, 1046-A Normandy Avenue, Chicago 35, Illinois.

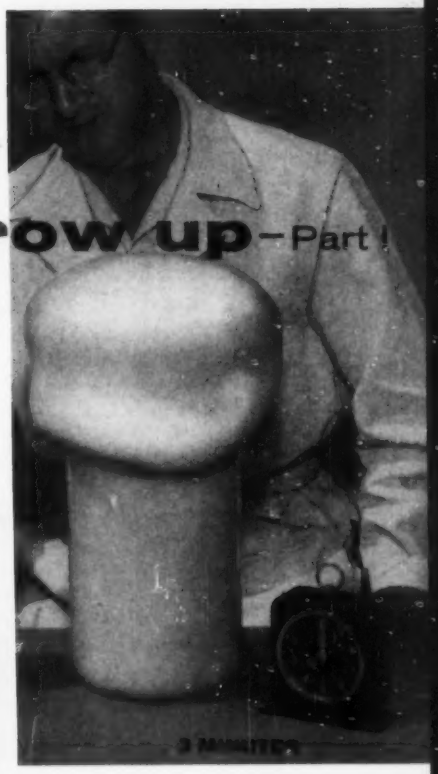
CAMPCO Sheet and Film, **a Division of Chicago Molded Products Corp.**

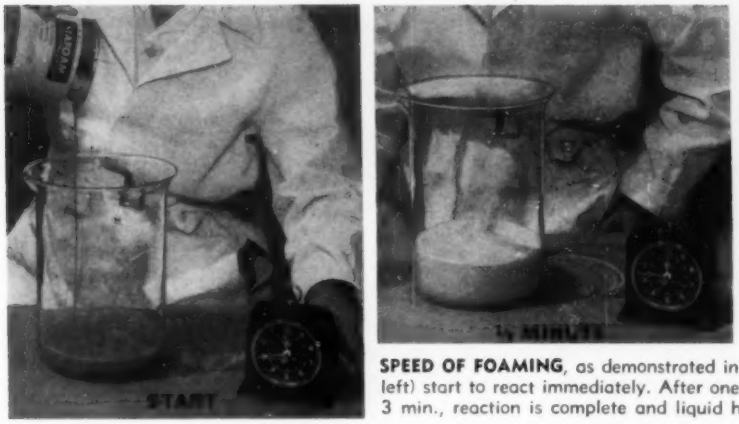
March 1959, Volume 36, Number 7

MODERN PLASTICS

The URETHANES grow up—Part I

First in a series of articles covers latest developments in materials, processing machinery, and markets for urethane foams

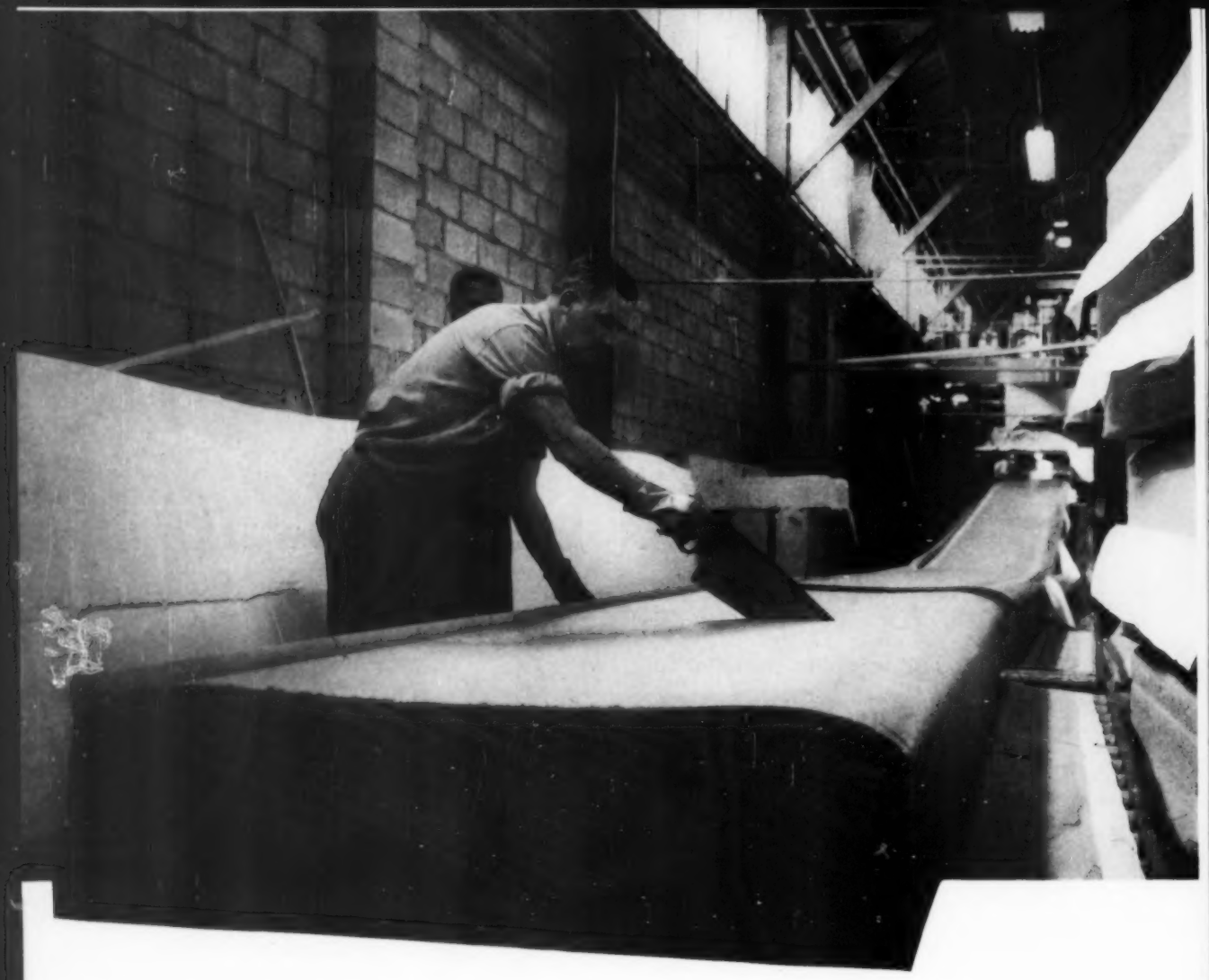




SPEED OF FOAMING, as demonstrated in American Latex laboratory. Ingredients (far left) start to react immediately. After one-half min. (center), foam starts to rise. After 3 min., reaction is complete and liquid has expanded about 30 times in volume.

In the past two years the urethane industry has grown from a few optimistic foam makers searching for markets to a highly diversified business that is chalking up sales records and spawning new applications every day. This metamorphosis of a laboratory curiosity into a material with a wide range of properties and with almost unlimited applications is a result of new chemical ingredients, refinements in technology, better processing equipment, and the establishment of meaningful test methods and sensible specifications for raw materials as well as finished products.

Top honors for the new chemicals must go to polyether glycols, first announced about two years ago by Wyandotte Chemicals Corp. and Union Carbide Chemicals Co., Div. of Union Carbide Corp. These chemicals gave to urethanes the spring-back action desirable in cushioning. Until the introduction of polyethers, the basic building block was polyester. Polyester foams, which are stiffer than the polyether type, do not provide that spring-back. And while they have many other useful properties, the price advantage is with the polyether (about 23¢/lb. compared with 40-



50¢/lb. for polyesters). However, differences in processing make it impossible to pass on all of this price differential in the finished foam product. Apart from resilience, polyethers also provide less compression set and superior aging than most polyester-based foams.

Most important, however, in terms of the furniture, bedding, and transportation markets, is the fact that polyether foams may soon be molded on a production basis. It is anticipated that such foams will be made in low-cost molds, with more intricate contours and superior properties than latex foam. Flexible polyester foam cannot be molded as easily, but vinyl foam is also bidding for the molded cushioning market.

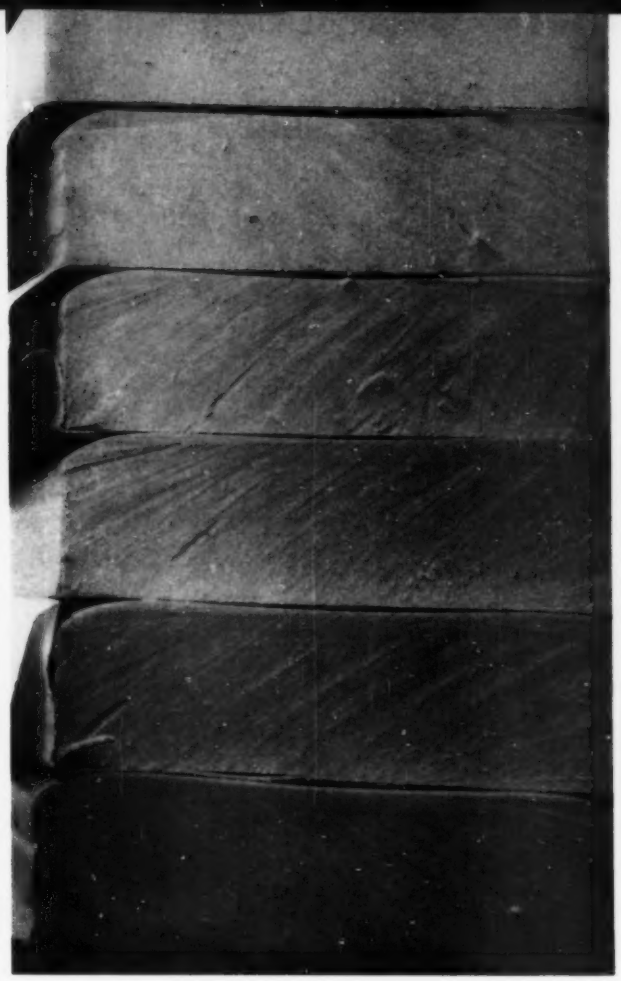
Polyether foams can be produced with a variety of built-in properties depending on the raw materials used. These raw materials, generally known as polyols, are in the main supplied by The Dow Chemical Co., Union Carbide Chemicals Co., and Wyandotte.

More recently Pittsburgh Plate Glass Co. and Emery Industries, Inc. introduced polyesters based on dimer acids, which again impart specific properties (e.g., softer texture), and Atlas Powder Co. developed a polyether based on sorbitol, a building block that might prove more economical for some types of foam.

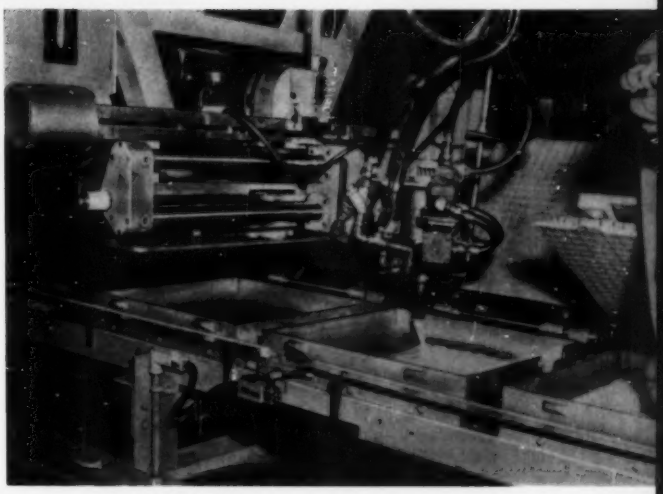
Catalysts also played their part in developing new manufacturing techniques and increasing the range of applications. Until recently, polyether foams had to be produced by the two-step prepolymer method. New catalysts, such as Dabco, manufactured by Houdry Process Corp., and a combination of catalysts using metallic compounds as key ingredients, have greatly simplified the production cycle for making cushioning stock, while at the same time providing greater control and simplified cure.

New machinery

The manufacturers of isocyanates (which are combined with polyols to make urethanes)—National Aniline Div. of Allied Chemical Corp.,



FOAM IS CUT (far left) and stacked for shipping at end of Nopco's 120-ft. production line. Continuous process transforms liquid resin mixture into a 1200-lb. slab of foam in about 30 minutes.

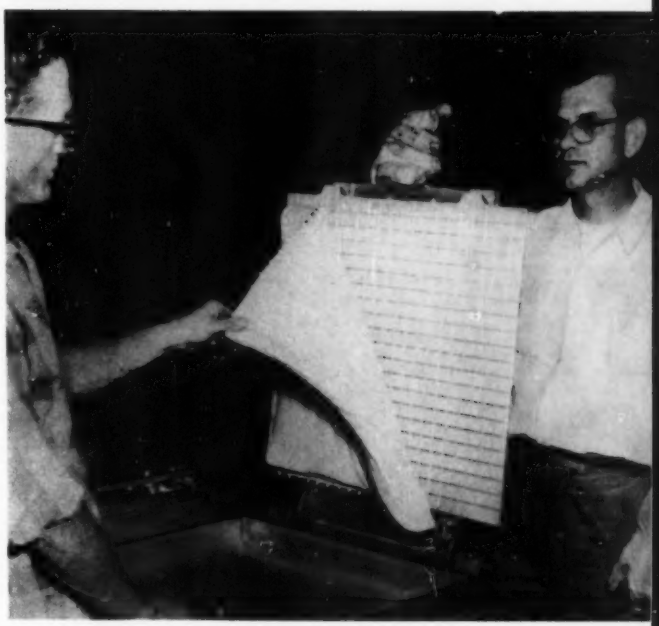


CUSHION MOLD being filled from over-head nozzle which is mounted on a traversing mechanism to insure uniform fill in machine built by Leon Machine and Engineering Co. Mold is automatically closed and locked before it passes through curing oven.

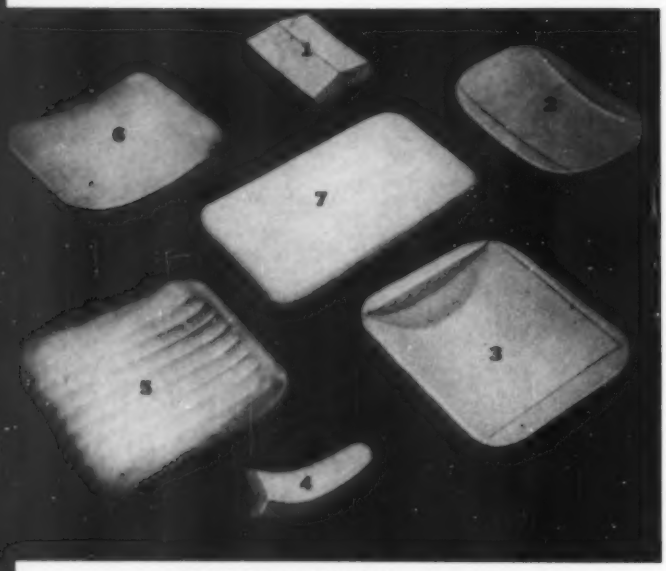
Du Pont, and Mobay Chemical Co.—have taken an active part in the development of machines and processes, as well as chemicals. For example, National Aniline has done much work on machinery and systems for rigid foams, including panel making equipment; Du Pont recently demonstrated a molding unit; and Mobay supplies most of the large production machines and has developed laboratory machines for slab stock as well as for intermittent foaming. These examples barely hint at the many development projects of major chemical suppliers.

Generally speaking, progress in machinery is confined to improving various components and increasing capacity. These aspects are certainly important but are not as radical as other changes that have taken place. Basically, all foam machines still consist of two or more pumping units, a variable mixer, a nozzle carriage assembly and, in many cases, a conveyor belt to transport and contain the liquid during the reaction process, until it solidifies into foam.

Various markets, especially for polyester



POLYETHER cushion is stripped from mold (shown being filled in photo at top) after approximately 8 min. in curing oven. In next operation, molded foam is squeezed between rollers to open the cells.



TRANSPORTATION SEATING units, molded by Bostrom, include: 1) backrest for John Deere tractor; 2) seat cushion for International Harvester; 3) contoured truck seat cushion; 4) arm rest for tractor; 5) back rest with fluted design; 6) back cushion; and 7) seat cushion topper pad.

foams, have been opened by ingenious slitters made by Fecken-Kirfel Maschinenfabrik, Aachen, Germany, and distributed in the United States by General Foam Corp., New York, N. Y. A similar machine built by A. Baeumer, Freudenberg, Germany, is distributed by Rapp Foreign Trade Corp., New York, N. Y. These profile cutting machines split foam in any desired thickness and produce sine, triangle, trapezoid, and other profiles in variable heights, dimensions, etc. The convoluted sheets can be combined to attain certain cushioning effects mechanically rather than chemically. Baeumer also manufactures a slitter which 'peels' the inside of a folded block of foam; it is used by Paramount Foam Industries, Ridgefield, N. J., to slit continuous sheets up to 300 yd. in length, down to 1/16 in. thick. Slitters, bandsaws, die cutting equipment, etc., are also supplied by Falls Engineering & Machine Co., Cuyahoga Falls, Ohio, and several other manufacturers.

What can be done today

As a result of progress made in chemistry and processing technology, slabstock can now be foamed 16 in. high, compared with about 9 in. a few years ago, providing production savings and greater consistency. Cell structure uniformity has been achieved and lighter foams can now be used in many applications, with proportionately lower cost per board foot—a 2 lb./cu. ft. density performs as well as a 2.3 lb./cu. ft. formulation of a few years ago—making it unnecessary to pay a premium for properties of higher density foams. Greater understanding of the chemical reaction and its relation to properties of the foam makes reproducibility easier and the final product more predictable. Experience with organic pigments has made it possible to make darker colors, and more heat and light stable foams. Longer runs, wider slabs—up to 80 in. wide—result in lower production costs and reduced scrap losses. Machine capacities are increasing, and up to 160 lb./min. can now be foamed, although most producers use somewhat smaller machines—generally of the Mobay/Bayer type—even for volume slabstock production.

APPLICATIONS

Flexible urethane foam has now reached a state of development that enables it to offer a serious challenge to the traditional pattern of several major cushioning markets—furniture, bedding, and transportation seating.

Furniture

Polyether foam is now being used by more than 200 furniture manufacturers in some or all of their lines. Against latex foam, its lighter weight, superior tear strength, and ease of fabrication—it can be sewn, stitched, stapled, and hog-ringed—often effect significant savings. Tufted and sculptured backs and arms can be made more economically, so that traditionally expensive furniture is now available in the medium price range. Greater skid resistance keeps fabric welting in place and can bring the convenience of zipper covers to more upholstery applications.

The choice of polyether and polyester foams in various densities enables manufacturers to provide the correct degree of cushioning for the various requirements of backs and arms of modern slim line furniture, wrought iron furniture, davenports, armchairs, etc. Fabrication and application of slabstock foam is easier and faster than using animal hair and other filling materials, and the end product is more comfortable and retains its shape.

It is now generally conceded that polyether foam possesses all the requirements for comfort cushioning—a property that has not been de-

fined in engineering terms, and depends to some extent on the individual preferences of furniture manufacturers. However, a large section of this market requires molded units, and in this respect latex foam is still a long way ahead of urethane. According to the urethane industry, the chemistry and technology of molding contoured cushions and sectionals is well advanced, but production is not only still somewhat limited, but also is barely out of the experimental stage.

The savings that will eventually be achieved by molded urethane are demonstrated by an office chair cushion supplied by Urethane Corp. of America, Medina, N. Y., for Ohio Chair Co., Youngstown, Ohio. Previously the chair was built up with a plywood bottom, coil springs, rubberized hair, Tuflex and a slab of foam. Now a contoured polyether cushion with a flange—which cannot be molded from latex, because of release problems—can be joined to the plywood base in one operation. Eventually, these cushions may be formed with an integral vinyl or fabric skin.

It is still too early to assess the extent to which urethane foam will replace latex foam, which now holds 50% of the total cushioning market. Estimates for 1958 vary, but it is generally thought that about 70 million lb. of latex foam, and between 10 and 15 million lb. of polyether (and some polyester) foam were used by the furniture industry. Bearing in mind a 2:1 density ratio of latex over urethane brings this proportion roughly to 70:30.

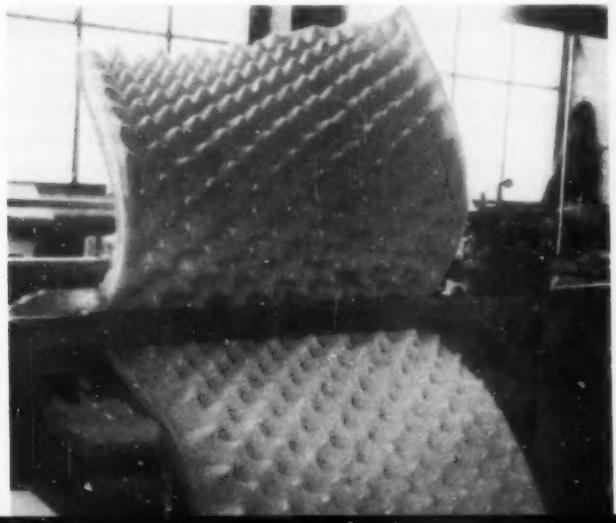
Such inroads in a very short time are probably sufficient to indicate a serious competitive threat by the new material, and might well persuade latex manufacturers to switch from pilot plant urethane production to large-scale operations to supplement, if not supplant, their major cushioning product. Current prices favor urethane over latex, and educated guesses show that this price differential can always be maintained, since urethane foam is based entirely on synthetic raw materials produced in the United States.

Bedding

At present, annual consumption of foam rubber mattresses is about 800,000 units. Despite the intense promotion that has gone on over the past few years, this is only about 10% of total mattress production in this country. Hopes of the urethane industry center around lighter weight; reversibility; higher tensile strength which permits stitching and tufting; better fire resistance than is afforded by latex; and resistance to dry cleaning solvents, oils, and perspiration.

Consumption of urethane foam by the bedding industry (which includes some pillows) is expected to reach between 6 and 8 million lb. by 1960, according to National Aniline Div. and Mobay. On the other hand, W. H. Ayscue, manager of chemical sales, Elastomers Dept. of Du Pont (responsible for the sales of isocyanates, the basic chemical in urethane foams), points out that ½ or ¾ in. of urethane in all the mattresses which do not use any foam at all at present, could add between 20 and 30

INTRICATE CONVOLUTIONS can be cut in urethane slabs up to 80-in. wide by bandknife slitters with special attachments. Below: Stock is split at General Foam Corp. into convoluted sheets; speed, about 30-yd. per minute. Shown at right is a close-up of slit sheet.



million lb. to the annual total within the next few years. Sears Roebuck & Co. is using 10 sq. ft. of $\frac{3}{16}$-in. foam as a border in five out of the eight innerspring mattresses in its catalog. Other mattress applications by Sears are sheets in the top and bottom. Dayton Rubber Co. is supplying Navy and submarine mattresses cut from uniform slabs, weighing 11 lb., and which are one-quarter the cost of 37-lb. rubber foam mattresses used previously. (For additional data, see also MPL *Encyclopedia Issue for 1959*, p. 357, "Flexible Plastics *vs.* Rubber Foams.")

Transportation

Automotive: In 1958 between 7 and 9.5 million lb. of urethane were used in the automotive field. The potential use is estimated to be over 24 lb. per car, although nobody in the industry would hazard a guess when this figure might be reached. Every automobile manufacturer is known to be either engaged in production test runs or evaluating urethane for seating, but uses are mainly crash-protection, vibration-damping, and insulation.

The largest single automotive use to date is for instrument panel trim and crash pads. These are usually made by vacuum-forming an embossed, flexible, thermoplastic sheet to the outer surface of the pad, which is then placed in a mold and the urethane foam formulation poured in. The mold is then closed and the foam is cured in an oven, after which the part is trimmed.

Several of the 1959 models also use urethane armrests, made from a slush molded vinyl plastisol skin, with foamed-in-place urethane, and a molded-in metal insert for attaching the rest to the door frame. Previously, armrests were made with a molded base, built up with sponge rubber, and then covered with fabric or skin. The new technique, with its important savings in assembly time, may also be used for instrument panels pads, visors, and horn button pads.

Topper pads are used in many of the 1959 automobiles and Chrysler Corp. is using urethane in hardtop rear seats, as a shock absorbing center section over the tunnel area.

Thermal insulating mats of this material are also used for air conditioner blower and evaporating housings. A foamed-in-place fire-wall, and similar sound and heat insulating are likely to appear in the near future.

Other automotive uses include side panels, carpet underlay, headliners, weather stripping, steering wheel padding, hood liners, etc.

According to one automotive spokesman, "where urethane foam is being used, it was selected because of its uniform quality, and because its characteristics made it attractive for a specific application. It also handles well, and does a good job of cushioning."

Aircraft: Flexible urethane also has obvious advantages in aircraft applications. For example, it was chosen for Fairchild F-27 seats because it is flame-retardant and only half the weight of other foams. Each seat uses 6 lb. of urethane and weight savings are said to amount to 130 lb. per plane. Boeing 707 jet transports use urethane for seat cushioning, mattress padding, carpet underlay, protective padding on hatracks and berth covers, and cushioning in the cockpit. Weight savings from 50 to 66% were achieved by using urethane insulation instead of the various natural and synthetic materials commonly employed in these applications.

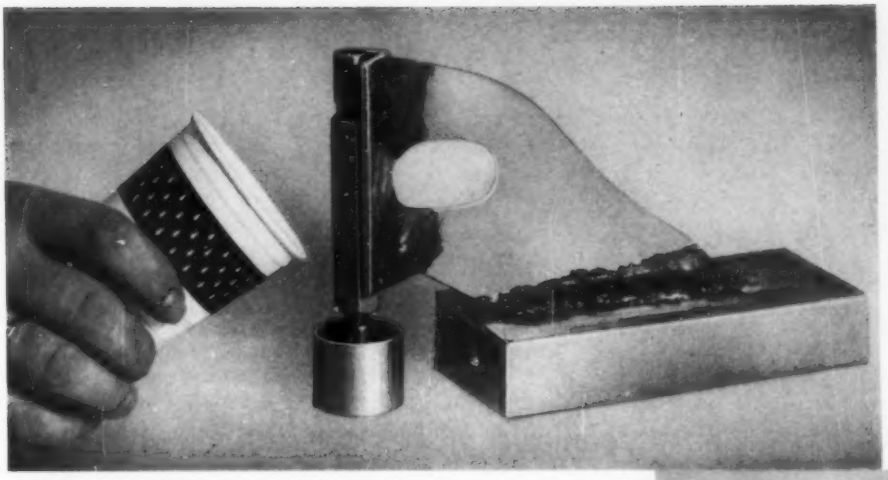
The comfort, wear, and safety features of this material also resulted in its acceptance for the upholstery of train and bus seats of the New York City Transportation Authority. Tests conducted by the supplier, Heywood-Wakefield Co., showed that it could withstand punishment greatly in excess of that received in normal transit usage.

A full line of scientifically engineered molded urethane cushions for transportation and tractor seats is now being maufactured by Bostrom Corp., Milwaukee, Wis. The company uses short waves from a machine built by The Thermatron Co. to weld the foam pad and vinyl-coated cloth with engraved stitchless seams in a variety of designs.

• • •

Next installment: Structure of the industry

AUTO ARMRESTS are made up of vinyl plastisol skins with foamed-in-place urethane cores.



IRON-FILLED epoxy resin and hardener, in cup, is about to be poured into ring-gage mold.

CAST EPOXY ring gage and plug used as male part of simple mold in which the gage was cast.

Cast epoxy ring gages cut cost from $60 to $2

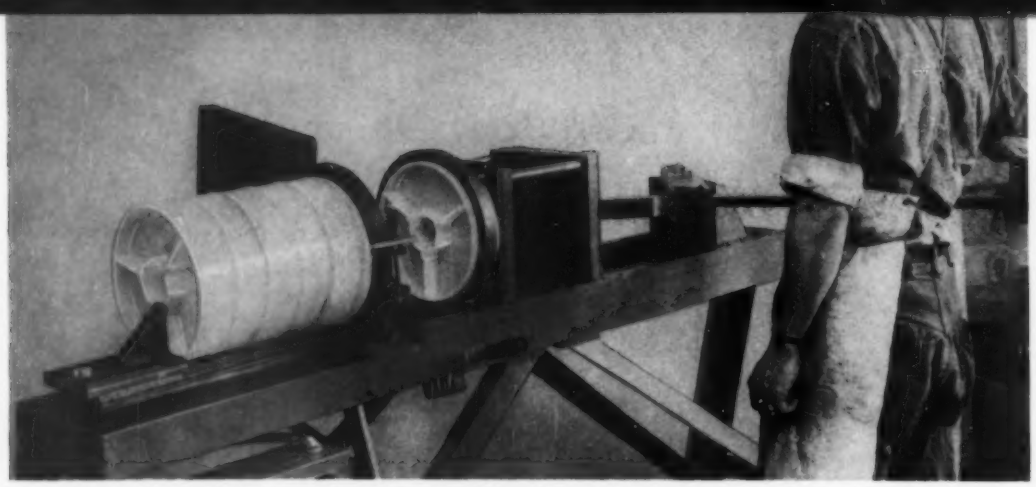
By D. M. Drummond*

Our interest in epoxy ring gages began with a production problem: we had to check the diameter of an electrode that was recessed inside a tube. A conventional ring gage was too large in O. D. to fit into the tube, and a special gage was quoted at $60 and three weeks delivery. Because these particular electrodes were needed immediately in production, we decided to try casting epoxy gages, using a standard plug gage as the size-determining male element of the mold. The first set of eight gages was cast and cured in one shift!

Thorough inspection of the bores of these gages revealed that the ring agreed in size with the plug to within 20 to 30 microinches, while its surface finish duplicated that of the plug. As for dimensional stability two gages made in Jan. 1957 were rechecked in Sept. 1958 and were found to have shrunk approximately 0.2 mil on the 0.25-in. diameter, or about 0.1 per cent. This small change was well within the tolerance for the part. Of course, we do not expect that the cast gages will have the wear resistance of hardened and ground steel gages.

The gages are easily made from an iron-filled epoxy resin, RP-3261, supplied by Ren Plastics, Inc., Lansing, Mich., as follows: 1) form the outside of the mold from sheet metal or slit tubing; 2) coat this ring and the plug gage with a wax or silicone release agent; 3) place the plug in its support and inside the ring; 4) mix the resin and hardener in a paper cup and pour the mix into the mold; 5) let the cure proceed for about 4 hr. at room temperature; 6) remove the gage from the mold, extract the plug, and trim the gage. Cost is about $4 for one gage (if you have the plug), $2 to $2.50 apiece for 6 to 8 gages.—END

*Manager, Time Standards and Work Simplification, Ordnance Dept., General Electric Co., Pittsfield, Mass.



CORE SECTIONS are added one at a time by heat sealing until desired length is reached. Heat-sealed sections are stacked at left; a new section is in movable chuck at center; heating platen (left rear) is in withdrawn position.

Ingenious heat sealing technique makes possible

Better cores at 1/2 the price

An interesting combination of injection molding and heat sealing fabrication has enabled Eastman Kodak Co., Rochester, N. Y., to produce polyethylene supply cores for rolled coated stock that 1) cost less than half as much as the combination metal and wood cores previously used, 2) are lighter in weight, and 3) have superior wearing properties.

Measuring 10 in. in diameter, the cylindrical supply cores are used by Eastman as a base on which to receive rolled coated stock of varying widths, to transport the material to other areas, and to stockpile between operations. Cores are required in quantities of several hundred. They must be as light as possible to facilitate handling, smooth, dimensionally stable, and accurately round in cross section.

The cylinders formerly used for this purpose were made of laminated wood surfaced with hardboard stock. In addition to costing more than twice as much as the molded polyethylene cores, these units were difficult to fabricate to the different lengths required by Eastman. Since the new plastic cores are made by heat-sealing a number of 2½-in. molded sections together on special equipment, they can be produced in almost any desired length. For a core incorporating six sections, for example, the unit is produced by making five successive heat seals, adding another section each time.

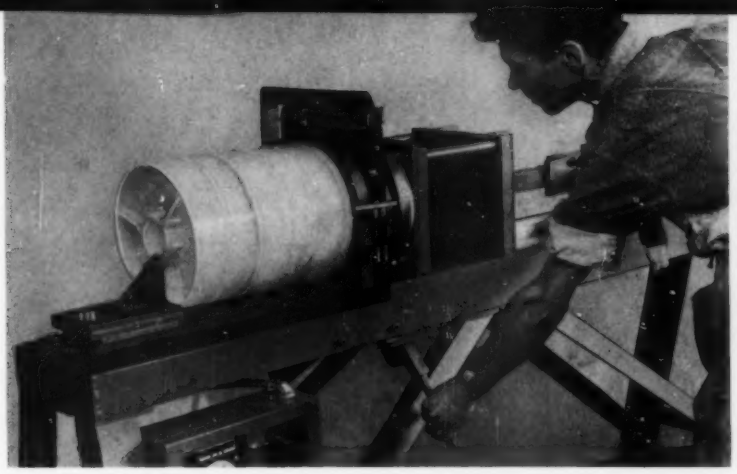
Finished supply cores must have smooth surfaces on which the coated stock may be wound. They must also be capable of withstanding rough handling without denting, scratching or rupturing of the outer surface. Material specified for the molded sections was Tenite polyethylene No. 840, having a melt index of 20. Ontario Plastics, Inc., Rochester, N. Y., injection molds the polyethylene components, as well as the nylon gudgeons used at each end of the finished core.

How cores are fabricated

Assembling the molded sections into a core of the required length is performed for Eastman Kodak by Cosom Engineering Corp., Minneapolis, Minn., using one of the Cosomatic heat sealing machines produced by this company. Equipment of the same basic type is used in heat-welding a variety of thermoplastic items ranging from practice golf balls and lightweight play balls to polyethylene canteens, novelty bowling pins for home use, specialized containers, and swimming pool floats molded in two halves.

To produce a core, a molded section is first placed in the stocking fixture mounted on the manually operated heat-sealing machine. Another section is then placed in a movable chuck at the right side of the unit. By means of a front lever, the operator brings an electrically heated platen into contact with the opposing faces of the sections.

After the heating period, operation consists



DURING heating cycle, heated platen is moved to a position between sections, momentarily contacting the surfaces to be welded together. Platen is then withdrawn and parts are brought together and fused under pressure.

of a fractional opening of the chucks, followed by rapid removal of the heating platen and a quick lockup of the parts by means of a lever-controlled toggle action. Stacking of the successive sections is accomplished by moving the left hand supporting fixture backward in a series of machined slots. Cycle time for each section is approximately 8 sec., with another 10 sec. required for placement and lineup of successive core sections.

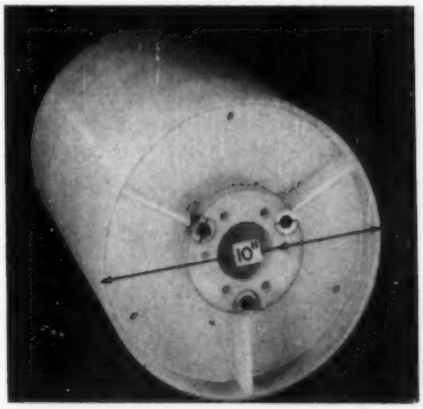
The assembled rough cores are shipped to Eastman Kodak, where the weld flash between sections is removed by finishing cuts on a lathe and the outer surfaces of the two end sections are faced to obtain the finished core length. After turning operations are completed, the sections are further strengthened by inserting three threaded steel rods which extend through the entire assembly and also pass through the nylon end gudgeons.

The assembly is compressed by tensioning the rods with brass nuts that nest in recesses in the gudgeons. Nylon was selected for these parts because the material molds efficiently in thick sections and provides a bearing which wears well. This point is important, since the end gudgeons connect the supply core to the driving spindle when the core is used for windup.

Adaptable to other products

Eastman's polyethylene stock supply core is noteworthy in that it demonstrates the feasibility of producing various types of large thermoplastic items by heat welding individual components together. In this manner, items which would be extremely difficult or impossible to mold as a single unit may be made without prohibitive tooling cost. The procedure lends itself particularly to products which, like the supply core, are made up of matching sections or several identical components produced from the same mold.—END

CROSS-SECTION of core (lower left) and welded core (right), showing welding flash at junction points which is removed by finishing cuts on a lathe. During the sealing operation, length of core sections is reduced to 2 inches. In final finishing, both ends of core are faced to obtain desired length.



COMPLETE CORE assembled with molded nylon end gudgeons which connect it to the driving spindle when core is used for windup. After cores are turned to remove flash and are machined to length, the gudgeons are fitted into molded-in recesses in the end sections of the core and locked in place by steel rods.

RESEARCH HOUSE built completely of panels having finished interior and exterior surfaces and foamed styrene cores. No conventional studding or framing was necessary because of the high load-bearing strength of the panels.

Building time cut from weeks to one day

Studless styrene foam core panels save on-site labor cost, exceed FHA specs

Rapid construction of fine homes at known costs, long a goal of the building industry, appears to be within reach. Structural panels with foamed polystyrene cores, which can be made with a wide variety of facing materials, offer a promising approach to the problem. In a recent demonstration, a standard six-room ranch-type home was erected, using such panels, in 35 man-hours of time; a five-man crew completed the job in one working day. This compares with three to four weeks using on-the-site labor to fabricate the shell of a similar house from conventional lumber-yard materials.

The cores of the new panels are Dylite expandable polystyrene, a product of the Plastics Div. of Koppers Co., Inc., Pittsburgh, Pa. Basic factory fabrication of the panels consists of coating the facing materials with an epoxy or resorcinol adhesive, framing them with 1 by 3 in. lumber, filling the sandwich with beads of the expandable plastic, and introducing steam through probes inserted in holes in the framing. The action of the steam expands the polystyrene to a foam that uniformly fills the interior of the sandwich. The result is a load-bearing panel which far exceeds the specifications of the Federal Housing Administration, yet is so light in weight that it can be readily handled by construction worker without necessity for any hoisting equipment.

Under FHA specifications a conventional studding wall must be capable of bearing a load of 500 lb./linear foot; the new foam-core panels are reported to bear loads in excess of 4000 lb./linear foot. In addition, the closed-cell structure of the plastic foam, which will not sag or pack with the passage of time, offers outstanding thermal insulation. Its effectiveness has been proved in use as an insulating medium for modern refrigerators, freezers, and ice buckets.

Versatility of modules

Since the new foam-core panels represent complete structural elements, they fit neatly into the concept of modular design. By this concept, homes of practically unlimited variations

can be erected by using component parts fabricated to a standard series of proportional dimensions. Thus, architectural freedom of design and decor are added to the economies of panelization.

Variety of facings

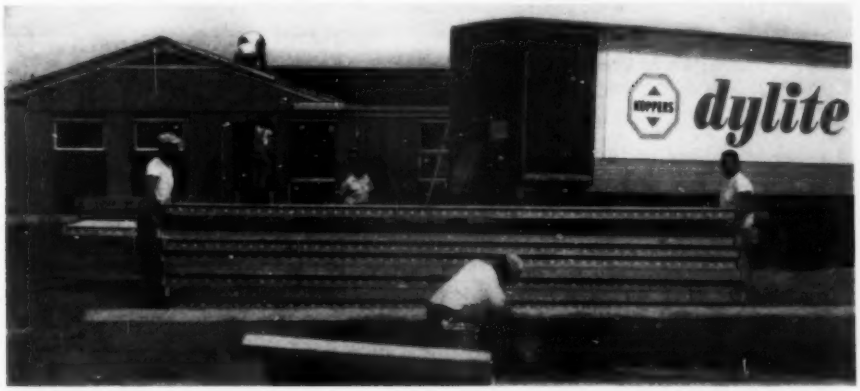
The demonstration home erected in 35 hr. was the 1958 Research House of the National Association of Home Builders, built at South Bend, Ind. Largest panels used were roofing members 18 ft. long, 4 ft. wide, and 4 in. thick, yet weighing only 190 pounds. The exterior facing of the wall panels was redwood siding, with plywood in areas under some of the windows. The roofing panels were faced on both sides with plywood. On the interior, a variety of facing materials was used, including plywood, Philippine mahogany, Masonite, gypsum board, and brick veneer.

The last represents an interesting approach to interior facings: regular brick is ground up, reconstituted into a slurry containing also epoxy or resorcinol adhesive, and sprayed onto the foamed styrene, which has previously been masked in a conventional brick pattern. After the necessary thickness of reconstituted brick has been built up and has set, the masking is removed, leaving a pattern of styrene foam visible that simulates mortar lines. The finished veneer has the look and feel of—and of course is—real brick.

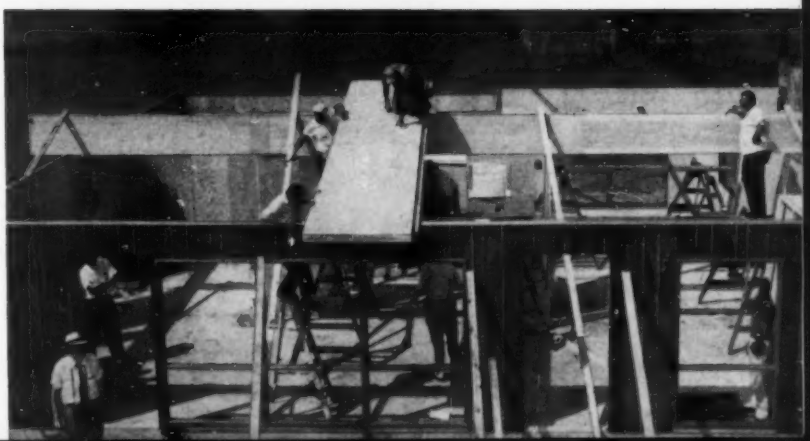
All of the panels necessary for the construction of the house were delivered to the building site in one tractor-trailer.

In addition to the facings used in the panels of the South Bend house, industry spokesmen foresee structural elements with facings of any number of plastics sheets as well as aluminum and steel. Moreover, they say, this type of panelization is readily adaptable to unlimited architectural shapes and forms and permits wide use of contours and textures in the design of wall panels.

Market analysis and problems of production and distribution of the foam-core panels have not yet been completely worked out. However, Koppers is confident that homes built with the new panels will be available in the near future and at prices which, on a completely erected basis, will be competitive with or lower than for homes of the same size and design constructed by conventional on-the-site fabricating methods.—END.

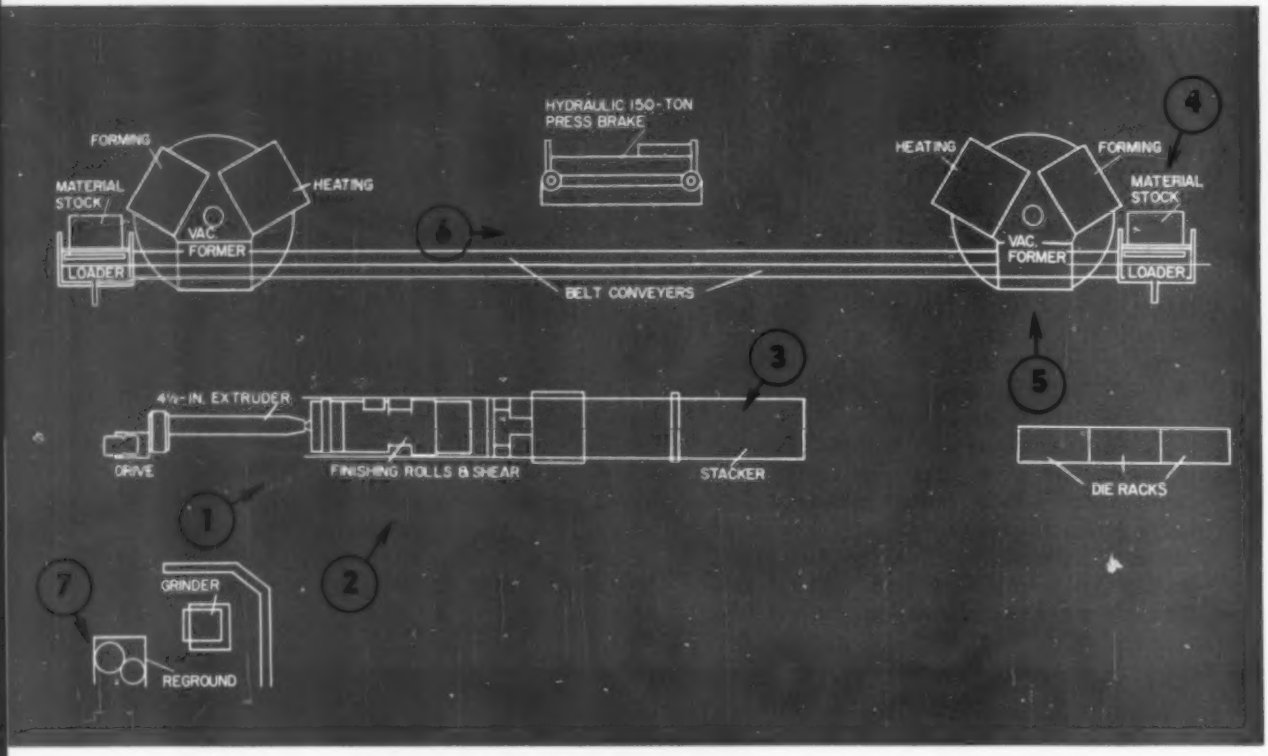


ROOFING PANELS 18 ft. long by 4 ft. wide weigh only 190 lb., can be readily handled by two men. All the wall and roofing panels for Research House were delivered to the building site in single trailer shown in the background.



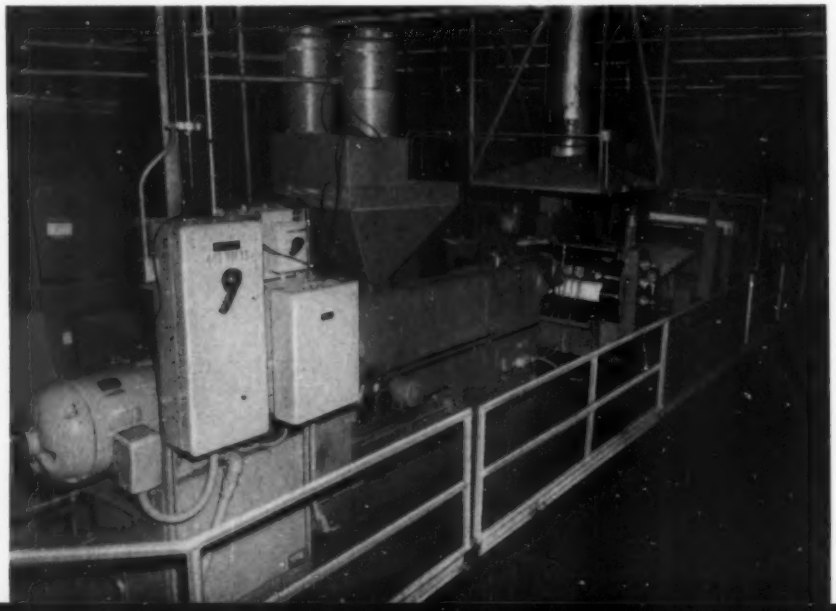
FIRST ROOF PANEL goes into place on Research House.

200 door liners



FLOOR PLAN, not to scale, of installation for producing thermoformed refrigerator door liners. Numbers refer to accompanying photographs; arrows indicate direction which camera faced.

1 **STYRENE ALLOY** sheet stock used in forming door liners is produced by vented 4½-in. extruder having a maximum capacity of more than 600 lb. of 0.100-in. thick stock per hour.



per hour—with 2 men

How refrigerator maker designed automated sheet forming facility to produce finished door liners at fabulous rates

Important lessons in the art of automatic sheet thermoforming can be learned from the captive door liner facility recently put into operation by Hotpoint Co., Chicago, Ill.

The installation consists of a 4½-in. extruder for production of sheet stock, two fully automatic rotary thermoforming machines, and automated handling equipment. So efficient is the setup that generally only two men are required to handle all operations.

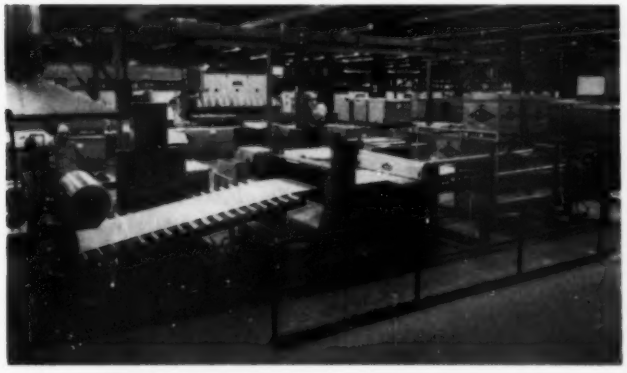
Maximum combined output of the two vacuum forming machines is approximately 200 liners per hour, the exact number depending on the type of liners being run. Forming cycles range from about 29 to 47 sec., depending upon material thickness, depth of draw, and other variables. Usually, operations are scheduled so that the extruder and forming machines are not run at the same time; instead, a sheet inventory is built up and efforts are then switched to production of finished liners.

An important key to the success of this installation is the automatic loading of precut sheet stock into the forming machines and the automatic conveying of formed liners to a large press brake where they are punched and trimmed, ready to be mounted in the refrigerator doors in an adjacent department.

The press brake is located midway between the two forming machines (see floor plan opposite), which rotate in opposite directions and feed the liners to a common terminal point. When liners are being formed, the two operators man the press brake, whose 12-ft. length permits two liners to be punched and trimmed simultaneously. From their central station, they can immediately stop either forming machine by push-button control should any interruption occur in the production cycle. Trimmed parts are deposited in containers and the trimmed "picture frames" hung on specially designed racks and transferred to the scrap grinding station.

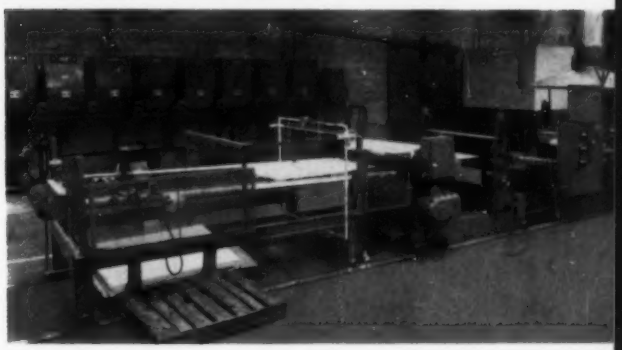
Material used is high-impact, rubber-modified styrene, currently being supplied by Union Carbide Plastics Co., Dow, Monsanto, and H. Muehlstein & Co., Inc. All lots of material are

The cooperation of William B. Minteer in developing this article is acknowledged. Mr. Minteer, formerly with Hotpoint, conceived the idea for the installation described.



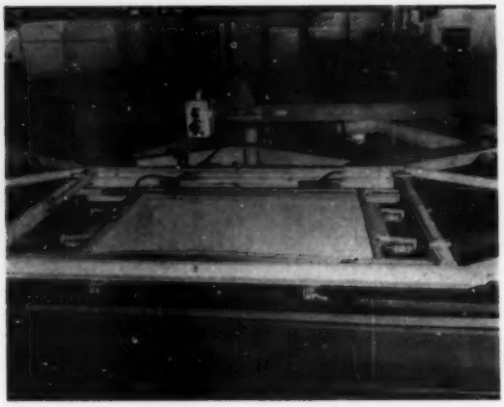
2 GENERAL VIEW of post-extrusion processing equipment, showing roll of oriented styrene overlay film (left) which is laminated to appearance side of extruder sheet stock to produce a high gloss. Automatic shear, beyond draw rolls, is operated by electric eye mechanism, cuts sheet stock to required length.

3 CUT SHEETS from automatic shear are dropped, one at a time, onto pallet by conveyor type stacker as they trip limit switch. Conveyor arms pivot downward to release sheet, then return to their original horizontal position.



4 PALLETIZED SHEETS are picked up singly by vacuum cups on reciprocating carrier and dropped onto in-feed conveyor. In photo above, rotary forming machine is at extreme right.

5 SHEET IS FED from conveyor to lift table which lifts it into clamp frame (foreground); frame carries it to heating section (left). In right background are fans which cool formed pieces before release from mold.



coded upon delivery and closely followed through the complete production cycle as part of a rigorous quality control program.

How it works, step by step

Extrusion of sheet stock: Sheet stock for the liners is produced on a 4½-in. vented-type Prodex extruder (Fig. 1) equipped with finishing rolls, an automatic shear, and automatic sheet stacker. The extruder, with 24:1 L/D ratio, is powered by a 60-hp. General Electric motor operating through a variable-speed drive made by Eaton Mfg. Co., Kenosha, Wis. Maximum output of the extruder is around 630 lb. of 0.100-in. sheet per hour. Tolerances are generally ±0.0015 inch.

Temperature control is provided over four zones in the extruder itself and three zones of the die, although the screw normally operates adiabatically. Stock temperature is usually held around 430° F., but can go to 450° F.

Venting the extruder barrel permits the escape of moisture, volatiles, and some raw monomer, improving the quality of the finished sheet and eliminating the need for predrying the material. Virgin raw material and reground scrap are blended in desired proportions by a time cycle arrangement in the extruder hopper, into which they feed through vacuum loaders directly from material drums. Automatic delivery of material into the hopper is regulated by a level control inside the hopper.

Leaving the extruder, the sheet stock passes through a chrome roll unit (Fig. 2), which includes two 8-in. rolls. This unit is set up to handle application of 2-mil transparent oriented styrene overlay film (Plax), which is laminated to the "appearance" side of the sheet on about 60 to 70% of production to impart a high gloss.

Next, the extruded sheet passes by way of rubber draw rolls through a shear opening onto a conveyor type stacker. When the sheet passes a predetermined point it triggers an electric eye mechanism, automatically operating a Famco shear. Proceeding to the end of the stacker, the sheet actuates a limit switch, causing the conveyor arms to pivot from beneath the sheet and allowing it to drop onto a pallet (Fig. 3). Palletized sheets, upon reaching a count of 100, are transferred by lift truck to a nearby sheet holding area.

The post-extrusion equipment was built by Robbins Plastic Machinery Corp., subsidiary of Lynch Corp., Elkhart, Ind., to Prodex specifications. All units are positively positioned by tie bars to permit movement for servicing the line and return to original location.

Automatic sheet loading and forming: The automatic feeding of plastic sheet stock into the two rotary forming machines is a notable feature of the installation. The loader consists basically of six parts—a sheet table, four rubber vacuum cups, a holding cup car, a fixed-speed conveyor, a lift table, and a variable-speed conveyor. It operates as follows:

With the forming unit set on automatic cycle, the clamp ring opens when it reaches the loading-unloading station. This allows the previously formed part to drop onto the conveyor which carries it to the punch and trim operation. At the same time, the rubber cups on the cup car move downward, sealing against the

top sheet on the sheet table. Vacuum is applied to the cups and they move upward, carrying the sheet with them (Fig. 4). Next, the sheet is transported by the cup car to a point above the fixed speed conveyor. Vacuum is cut off, and the sheet drops onto the conveyor.

The sheet then travels to a point directly below the forming machine clamp frame where it is held by a stop until the lift table raises it into the clamp ring. When the lift table reaches the top of its stroke, the clamp ring automatically closes, holding the sheet in position for the next forming cycle (Fig. 5).

The two fully automatic rotary vacuum forming machines will accommodate parts up to 42 by 72 in. in size. They were manufactured by Brown Machine Co., Beaverton, Mich., which also supplied the automatic loading equipment and conveyors which carry formed liners to the press brake. Sheet stock is heated by Chromalox far-infra-red elements located above and below the sheet and adjustable for distance. Heaters are controlled by percentage timers which vary the power from 0 to 100% of maximum rated capacity.

Molds are of cast aluminum. Cooled with water, they are held at approximately 140° F. by means of a Brown temperature controller. A safety switch on the forming machines makes it possible to retract the mold in mid-cycle, to introduce any inserts.

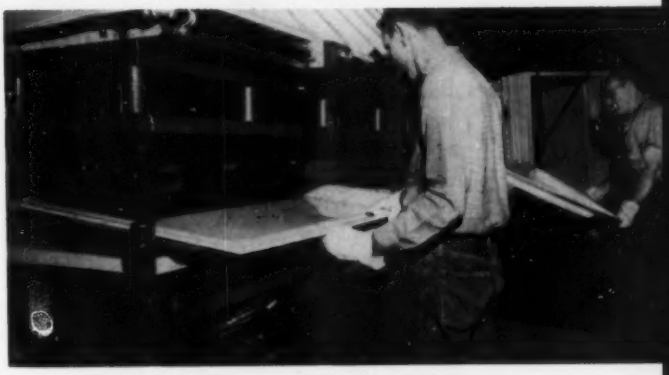
Punch and trim operation: Formed liners, carried by conveyor to within convenient reach of the operators, are punched and trimmed on a 150-ton hydraulic press brake made by Pacific Industrial Mfg. Co., Oakland, Calif. The unit is equipped with micrometer settings to control stroke, tonnage, and level. Absence of corner posts provides an unobstructed working area approximately 4 by 12 ft. in size, permitting simultaneous punching and trimming of two door liners (Fig. 6).

Handling of scrap: After removing punched and trimmed liners from the press brake, operators stack the finished parts and hang the trimmed "picture frames" on specially designed wheeled racks on which they are periodically transferred to a grinder made by Alsteele Engineering Works, Inc., Framingham, Mass. Located adjacent to the extruder, the grinder has a 12- by 36-in. throat, sufficiently large to accept even the largest trimmed frames (Fig. 7). Mounted in a deep pit, the grinder is surrounded by walls on three sides and soundproofed with Fiberglas batts.

Reground material is drawn from the grinder through a completely closed system into a recovery chamber. It is periodically emptied into material containers for re-use in the extruder. Any powdery residue is automatically separated into another collection chamber, using an Arco Wand recovery unit made by American Vacuum Co., Skokie, Ill., making regrinding process virtually dust-free.

What is the significance?

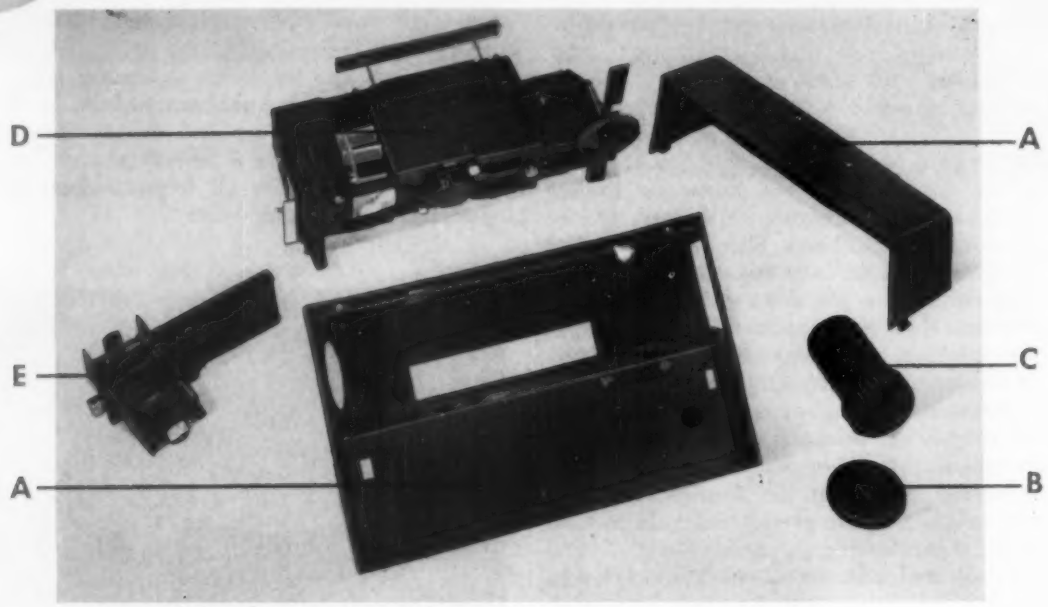
The success of this operation puts to rest once and for all the notion that automated sheetforming is confined to the production of small pieces. The feasibility of forming *large* items on a production basis has now been demonstrated. It may be expected that this technique will soon become a general practice, an economic necessity for all formers—captive, custom, and proprietary.—END



6 **PRESS BRAKE** with 4- by 12-ft. working area can simultaneously trim and punch two liners. Trimmed "picture frames" (right background) go on racks which carry them to scrap grinder.

7 **HIGH-CAPACITY GRINDER** with 12- by 36-in. throat regrinds material removed during the punching and trimming operation. In foreground are tubular racks on which frames are carried.

How better



MANY PLASTICS PARTS contribute to the styling and operation of the Opta-Matic projector (top left). Elements (lower view) include: A) two polyethylene housing parts; B) polyethylene lens cover; C) phenolic lens barrel; D) phenolic chassis in which is located a nylon blower wheel; E) slide changer mostly of phenolic and nylon parts.

Photographic slide projectors, long wedded to metals for their main structural elements, are beginning to switch to plastics for these components. At least three producers of high-quality projectors are now using various plastics in such major elements as housings, slide changers, and cooling fans. Gains: lower costs, greater freedom of design, improved styling for an appearance-conscious market, lighter weight, more serviceability—and more sales.

The Opta-Matic

Most spectacular of these new projectors, from the plastics use standpoint, is the Opta-Matic, marketed by Optics Manufacturing Corp., Philadelphia, Pa. The entire two-piece housing is injection molded of Phillips' Marlex high-density polyethylene. One part of the housing includes the integral base and encloses the optical system, lamp, etc.; the other is removable to give access to the slide-changing mechanism while the projector is being used. When the latter is in place, the projector is entirely enclosed and no separate carrying case is needed.

After an intensive testing program of a number of other materials for the housing, Optics Manufacturing decided upon high-density polyethylene because it had "the required rigidity, resistance to heat and impact, colorability, and gloss." So thoroughly is the company sold on the material that it gives an unprecedented lifetime guarantee on the housing. And because the polyethylene can be ac-

slide projectors are made

High-density polyethylene, impact styrene, and vinyl-metal laminate parts are used by three big brands for greater design freedom, lower cost, lighter weight—and more sales

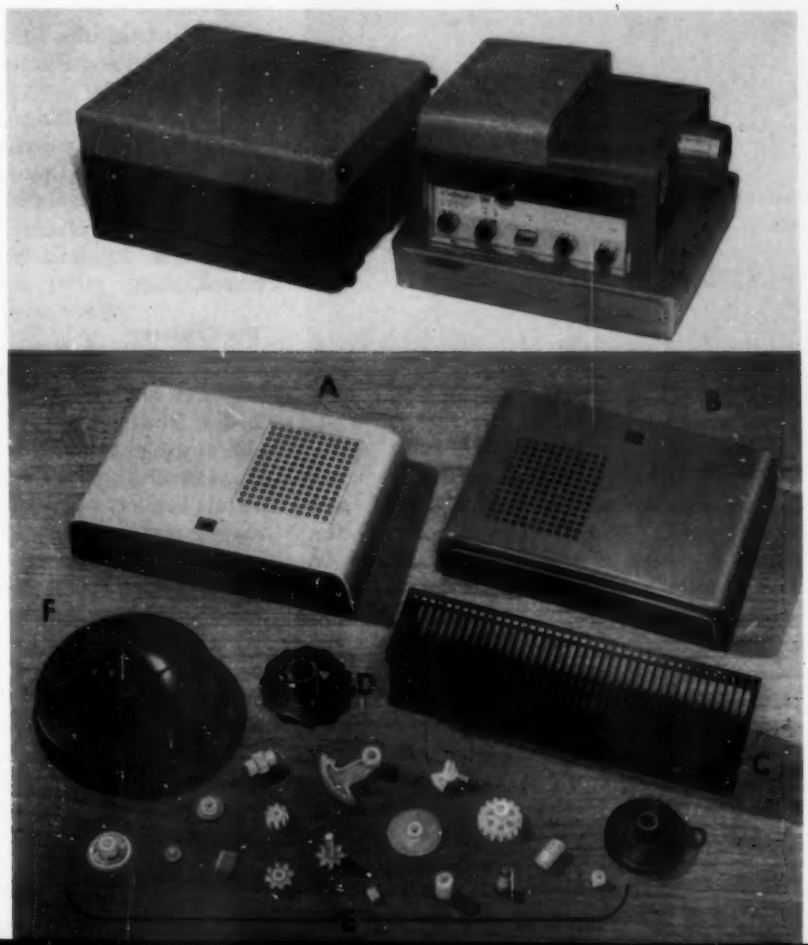
curately color-matched, the projector can be manufactured in the Riviera Blue that is identified with Optics' line of hand viewers which is already on the market.

While the light weight of the material was not originally considered as an important design factor, it was subsequently found significant for two reasons: the projector is easier to carry and shipping costs are lower. The complete unit weighs just a little under 6½ pounds.

Molds for the two housing parts were made by Standard Tool & Die Co., Leominster, Mass.; the molding is done by Molded Insulation Co., Philadelphia, Pa.

Other uses of high-density polyethylene in the Opta-Matic include a lens cover, molded by General Plastics Co., Philadelphia, Pa., and the elevating wheel at the front end, molded by Auburn Plastics, Inc., Auburn, N. Y.

Inside the polyethylene case of the Opta-Matic is a high-heat resistant phenolic "chassis" which serves as an assembly center for the optical system, the cooling blower (molded of nylon by Molded Insulation Co.),



MOLDED STYRENE cover over rear half of Balomatic projector (above right) has group of ventilating holes to permit air circulation around lamp. Parts (below) are A) cover with melamine grille insert for 500-w. model; B) cover with integral grille for 300-w. model; C) phenolic slide rack. D) phenolic adjusting wheels; E) nylon operating parts. F) phenolic blower fan.

the retracting handle, and the elevating wheel. The parts of this chassis are produced by Norton Laboratories, Inc., Lockport, N. Y. The lens barrel is also molded of phenolic.

One of the most interesting mechanical parts of this projector is the manually operated slide changer which holds up to 36 slides in a front magazine, delivers them one at a time to projecting position, and then stacks them in sequence in a rear rack—all with a simple push-pull motion. This changer unit, an invention of Eastman Kodak Co., consists of an assembly of phenolic parts, stainless steel springs, and a molded black nylon element which carries the slides back and forth. At present, these units are supplied to Optics by Kodak. However, Optics is now tooling up to produce them under a Kodak license.

VINYL-METAL laminate in housing of new Explorer projector has richly grained surface, provides design, styling, and production advantages.

The Balomatic

Four different plastics are used in the new Bausch & Lomb Balomatic slide projector, which is made in a fully automatic 500-w. model and a semi-automatic 300-w. model. A Bausch & Lomb spokesman states: "The best and most economical way to make the many parts of intricate shape and contour which go into the Balomatic slide projectors was molding them of plastics. A wide selection of eye-pleasing colors was available, and the lightness of the plastics helped reduce the weight of the units. Nylon was used in gears and other moving parts to take advantage of its wear-resistance, quiet operation, dimensional stability, and strength."

In both Balomatic models, the cover panel is molded of Dow Styron 440 polystyrene by General Industries Co., Elyria, Ohio. A grille having 143 holes at a slant relative to the face of the cover to permit circulation of air, while minimizing escape of light, is part of each cover. In the 300-w. model, the holes are molded-in; the cover for the 500-w. model is produced in the same mold but with an insert to produce a square hole. Into this aperture is inserted a molded melamine grille. The reason for the change is that the heat generated by the 500-w. lamp directly under the grille is considerably more than a thermoplastic material can stand.

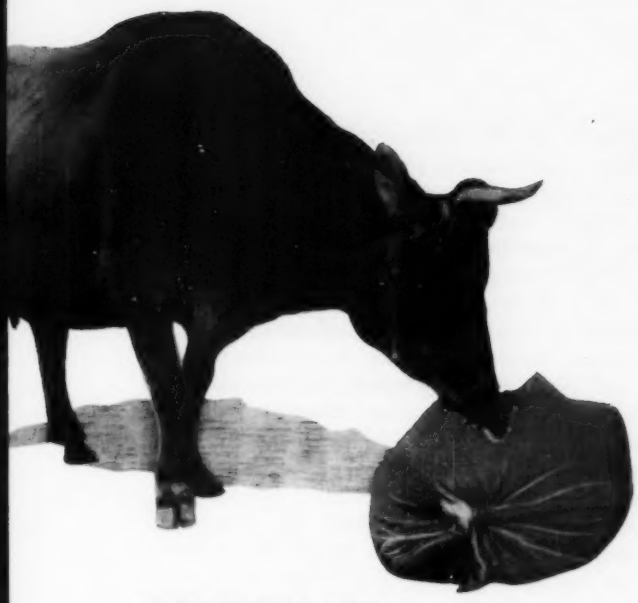
Set into the covers of both Balomatic models is a clear styrene window for viewing the index numbers of the slides being projected. A folding handle is molded of medium-impact polystyrene (Dow Styron 777), while the slide trays are of rubber-modified styrene, also supplied by Dow. Phenolic is used in the blower fan, the elevating and tilting wheels, and the slide rack. The fan assembly is molded by General Industries; the adjusting wheels are supplied by Jersey Plastic & Die Casting Co., Irvington, N. J.

The nylon operating parts of the Balomatic were all specially designed for the purpose. They are furnished by four different molders: Nylomatic Corp., Morrisville, Pa.: Ontario Plastics Inc., Rochester, N. Y.: Quinn-Berry Corp., Erie, Pa.: and W-L Molding Co., Kalamazoo, Mich.

The Explorer

Outstanding plastics application in the new Explorer slide projector series produced by Bell & Howell Co. is in the housing which is also designed to eliminate the need for a separate carrying case. The material used is a vinyl-metal laminate. It brings rich styling and rugged wearing qualities to the projector and has the added production advantage of requiring no further metal finishing operations after forming.

The laminate used by Bell & Howell is produced by Clad Rex Corp., a subsidiary of Simoniz Co., Chicago, Ill. It is furnished to the projector manufacturer in sheet form, where it is blanked to size and formed in matched metal dies.—END



MORE SAVINGS for the farmer

New agricultural uses of polyethylene and vinyl film bring increased efficiency and greater economy

SILAGE WITHOUT A SILO is provided by this polyethylene bag, which allows fermentation gases to escape while keeping out air. Farmers can now buy silage in quantities that they need, such as this 100 lb. bag.

BIN LINER of plastic film converts conventional corn storage bin into airtight container for high-moisture corn. Here props support rolled up liner as workman covers outlet pipe.

Three new developments in agricultural applications of plastics film promise to add even more to the many advantages farmers have derived from plastics films. These developments, which have been successfully tested on a number of university and government farms, involve 1) polyethylene film for bagged silage; 2) plastics bin liners for airtight storage of high-moisture grain; and 3) use of vinyl film to control water weeds.

Bagged silage

Silage packed in plastics bags is a radically new method of distributing livestock feed. It allows the small scale livestock farmer to buy fodder in quantities that he needs. It also provides the forage producer with a method of marketing a product that might otherwise be wasted.

Previous attempts with silage in small quantities failed because air entering the package caused complete spoilage. A silage container must allow fermentation gases to escape, but hold back air. Polyethylene does this job, as was demonstrated in recent experiments at the University of Missouri with Visking polyethylene film bags. Using 6-mil films, investigators found that good silage can be produced and maintained in polyethylene bags for protracted periods.

Liners for hermetic storage

Storage bin liners, of both polyethylene and vinyl film, can provide a low-cost method of converting conventional metal corn storages into airtight storages for high moisture corn. The feasibility of such storage was established at the Purdue University Throckmorton farm.

The economic superiority of high-moisture over dry corn as hog feed is well established,

TUBE IS UNROLLED as filling progresses. When the bag is filled, it is gathered at the top and tied like a feed bag. High-moisture corn fattens hogs faster and at less cost.

and, in tests at Purdue, feed costs on high-moisture corn averaged $7.78 per 100 lb. of gain by the hogs, compared with $8.14 for 100 lb. of gain on dry corn. The cost of storing high-moisture corn in polyethylene-lined bins, according to Visking Co., is only 30¢/bu. in a bin of 10,000-bu. capacity compared with $1/bu. in other types of airtight storage units. For a storage bin of 5000-bu. capacity, the comparison is even more favorable to plastics—35.5¢ against $1.50. Cost of the film alone is 5½¢/bu. stored in 500-bu. bins, somewhat less for larger storage.

Weed control

Vinyl film used to control waterweeds is the latest pond application for the plastic (the material is already established as a pond liner to cut water seepage in porous ground). Use of the film eliminates costly chemical treatment and inefficient handraking of such weeds. Submerged aquatic plants are a common pest in ponds and streams. They interfere with livestock watering, irrigation, recreation, foster the breeding of mosquitoes, and often contribute to an offensive odor.

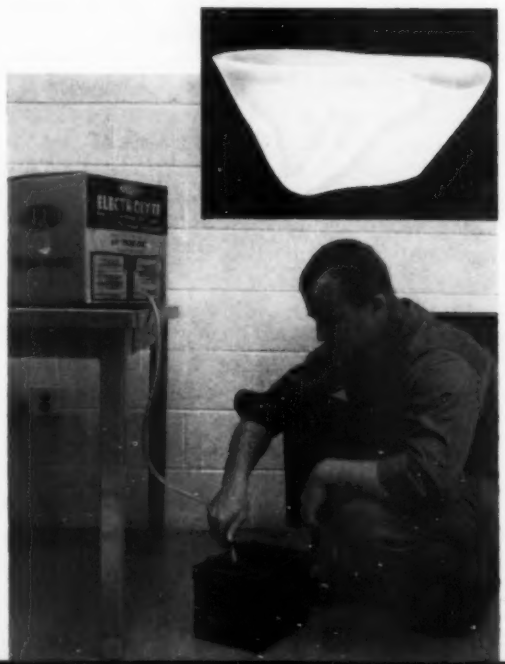
In a Millwood, Va., spring-fed pond, 8-mil Bakelite vinyl film was used successfully to control waterweeds after conventional treatment had completely failed. The film was held down by hemming a large sheet at both ends and inserting galvanized pipe. In one test, the weeds were thoroughly raked out before the vinyl bottom was installed. Four months later, those areas which had been left uncovered were again choked with weeds while there was no sign of a living plant under the opaque vinyl film. In other tests, the cover was laid down over a heavy weed growth and left through the winter. By early spring, the area beneath the liner was clean and barren of weed growth.

The effectiveness of the film is due to the fact that it cuts off the sunlight that plants need for growth. The film is heavier than water so it sinks to the bottom and lies flat.

Each of these new developments represents a potential large-scale application and gives more weight to the prediction that the $33 billion agricultural industry will consume anywhere from 100 to 375 million lb. of plastics annually by 1965. (See "Plastics' stake in agriculture," MPL, April, 1958, p. 91.)—END

Polyethylene film liner for electrolyte container

A convenient new way to dispense acid for dry-charge batteries is offered by the Probepak, a 5-gal. throw-away container which consists of a polyethylene film liner inside a corrugated carton. A molded PE probe attached to a hose is inserted directly through the carton and liner at an indicated spot. Because of the plastic memory of the polyethylene film, the liner seals itself about the probe, preventing leakage. The new package, which weighs 56 lb. filled, was adopted after testing which included storage of probed containers for over two months without leakage. Packages were also pushed off tables without dislodging the probe. The package is manufactured by Hedwin Corp., Baltimore, Md., which vacuum-forms the liner in two parts of 10-gage Du Pont Alathon 20 film, and heat seals it. Inset at right shows one half of liner.—END



Marine markers with endurance

Specialized machine produces sturdy markers of polystyrene foam core and reinforced epoxy skin

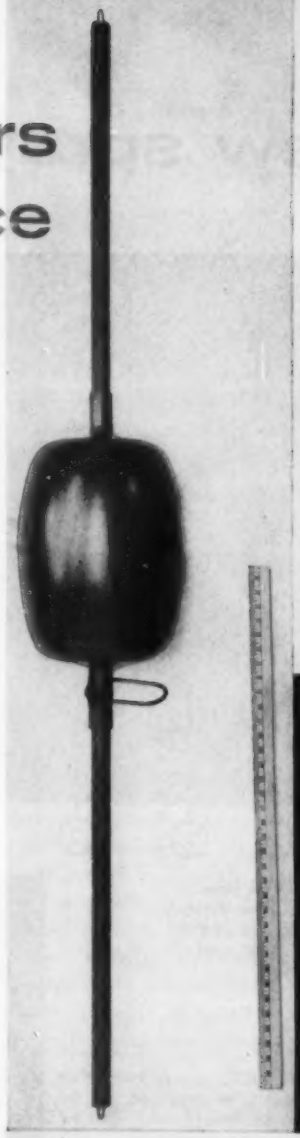
Light weight and exceptional durability are two outstanding attributes of the Danbuoy, a specialized type of mine float now being produced for the U. S. Navy by Valco Corp., St. Paul, Minn. The float has a styrene foam core covered with fibrous glass rovings and epoxy resin by a filament winding process.

The finished Danbuoy measures approximately 15 in. long and 12 in. in diameter. Since it is used to mark mine locations and must frequently be pulled aboard ship and dismantled for transfer to another area, extreme ruggedness is required. The necessary strength, without excess weight, is obtained by winding the core with layers of fibrous glass filaments, encasing it in a glass-epoxy shell $\frac{1}{16}$ in. thick.

The first float cores used by Valco were made by cementing slabs of foamed styrene stock together and machining to size. However, the company reports that in volume production it will undoubtedly foam its own cores. Mounted on a reinforced plastics tube, the core is placed in the specially designed winding machine, where 60-end glass rovings are automatically impregnated with epoxy resin and wound on the core. After the wet-out rovings have been wound to the desired thickness, the epoxy is cured by revolving the floats under a bank of infra-red lamps.

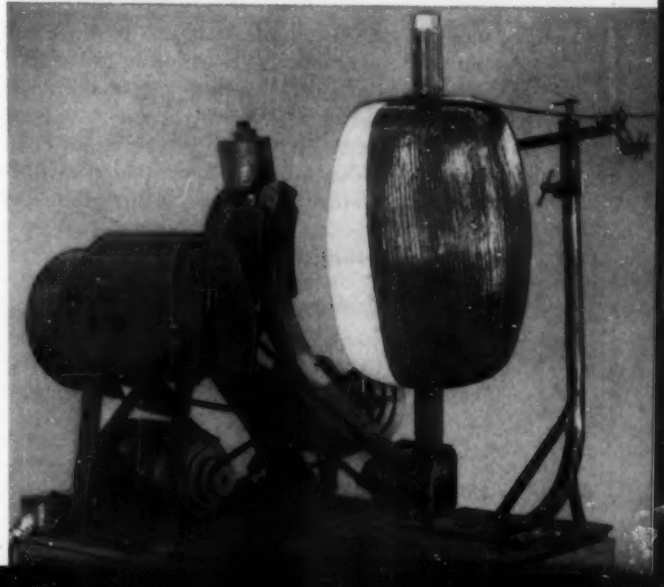
The machine is designed to revolve once about the major axis for every 135 turns about the minor axis. This ratio can easily be changed to accommodate larger rovings or a larger number of rovings.

This development represents an important extension of the filament winding process which, in the past, has been used primarily for the production of hollow pressure vessels. It paves the way for new floatation applications requiring light weight combined with exceptional sturdiness.—END



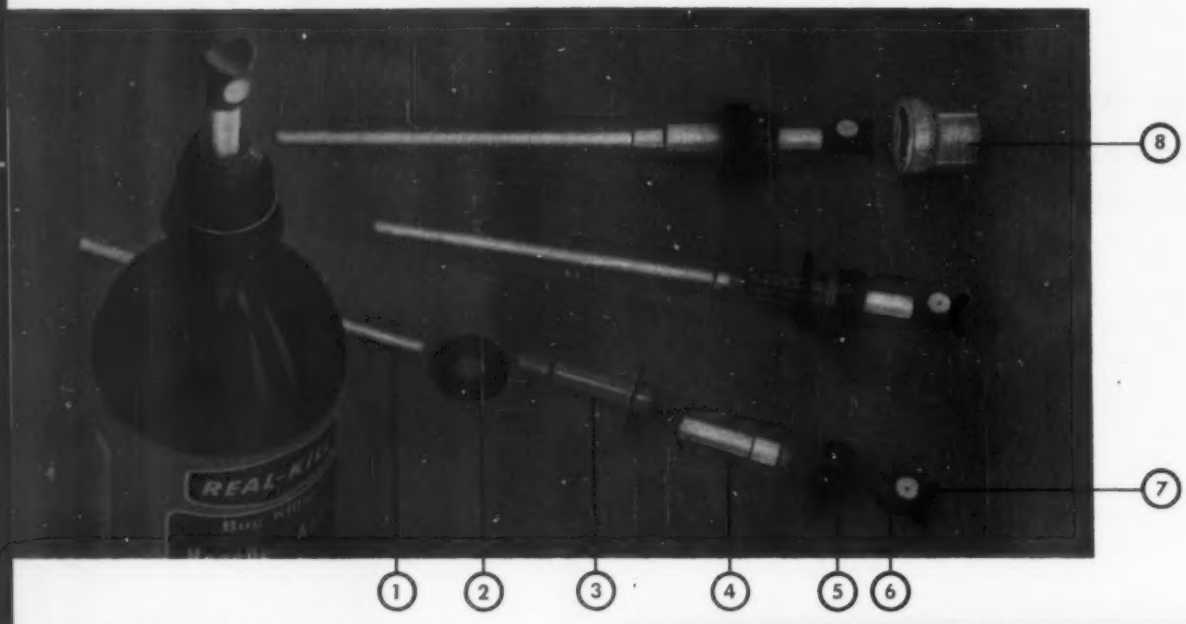
MINE-MARKING float used by U.S. Navy consists of foamed styrene core with $\frac{1}{16}$ in. fibrous glass-epoxy shell, mounted on reinforced-plastics counterweight tube. Handle is lashed to buoy with epoxy-impregnated filament, permits it to be lifted easily aboard ship.

STYRENE FOAM core (below), prior to filament winding operation. Originally fabricated of foam slabs cemented together, core will probably be molded of expandable styrene beads in volume production.



FILAMENT WINDING OPERATION, handled on specially designed machine, shrouds core in tough reinforced plastic shell.

New sprayer challenges



EXPLODED VIEW of sprayer shows 1) vinyl dip tube; 2) polyethylene inner seal. Five styrene-acrylonitrile copolymer parts: 3) transparent body, 4) plunger, 5) collar, 6) head and 7) orifice nozzle, 8) polyethylene cap.

FINELY DISPERSED MIST, approaching that obtainable with aerosols, is produced by the plunger-type sprayer at lower cost. Material sprayed is the residue-type insecticide.

Substantial reductions in end product cost are made possible by a recently developed pump-type sprayer. The new unit, made up of eight molded and extruded parts involving three different materials, is precision engineered to produce a mist approaching in fineness that obtained by an aerosol spray and because of the economics involved may capture a sizable part—but not all—of the aerosol market.

How prices compare

The sprayer sells for 8.6¢ each in lots of 5000; this price is scaled down to 8¢ in lots of 100,000. Costs for aerosols include 5 to 20¢ for propellant gas (Freon type), 4 to 10¢ for the necessary valve, and frequently an additional loading charge ranging from 3 to 5¢ per container.

In terms of end product, the economies made possible by the new sprayer are well illustrated by a standard insecticide. A 14-oz. low-pressure aerosol bomb, which sells for 98¢, contains 6 to 8 oz. of insecticide, the remainder being propellant. A full quart (32-oz.) of the same type insecticide can be purchased in a bottle, complete with sealed sprayer, for about the same amount.

The sprayer is manufactured by Bakan Plastics, Inc., Kansas City, Mo., using vinyl,

polyethylene, and Tyril styrene-acrylonitrile copolymer.

An important consideration in marketing this sprayer was that it would be leakproof—both in transit and in use. This is achieved by means of an inner seal and a protective cap which fits tightly over the sprayer head. Both the seal and cap are molded of standard low-density polyethylene. The dip-tube is extruded of semi-rigid vinyl.

Why styrene-acrylonitrile?

All other parts are molded of styrene-acrylonitrile copolymer. These include a transparent body for assembly inspection, a plunger, a head with swirl chamber to give more uniform particle size and spray pattern, an orifice nozzle, and a threaded collar to which the protective cap can be fastened. Styrene-acrylonitrile copolymer was chosen for these parts because of its chemical resistance combined with low cost and easy moldability. Heat resistance of the material is also important; it will resist temperatures up to 200° F., providing a good safety margin for products exposed to the heat of a ship's hold or in a retailer's window.

Each part of the sprayer is precision molded to a tolerance of ±0.002 in. for maximum efficiency and operating ease. This precision molding makes possible an orifice pressure of up to 100 lb., which in turn results in a finely dispersed mist that covers twice the distance and delivers up to one-third more volume than other pump-type sprayers of the same size, according to the manufacturer.

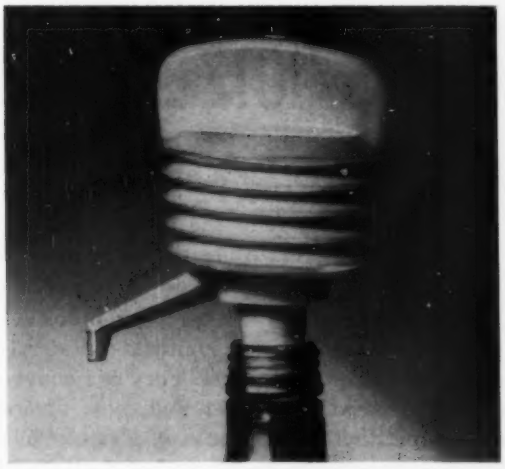
The container cap, which has a standard thread for attachment to standard bottle or can necks, is manufactured in metal, phenolic, or urea.

25 million units this year

A wide variety of products can be dispensed with the new sprayer. Both the sprayer unit and leakproof protective cap are delivered completely assembled for high speed packaging lines.

The cost savings made possible by the sprayer, which can be passed on to the consumer, assure it a wide sales potential in convenience packaging. The headway already made is indicated by Bakan Plastics' estimates that current production of this type sprayer is at an annual rate of 25 million units. However, the device has its limitations. As presently designed, it is not expected to compete in the cosmetic fields or in other applications involving extremely fine spray.—END

Bellows bottle pump from high-density PE



Blow molded high-density polyethylene "bellows" have now found application in a novel pump-type dispenser. Used in conjunction with a polyethylene tube, the dispenser fits any standard liquor bottle and discharges a controlled amount of liquid.

Production of similar bellows shapes was first publicly shown at the recent Plastics Exposition in Chicago, Ill. The items made there were pepper shakers blown in a two-cavity mold. The present product, weighing less than 1 oz., is made in a multiple-cavity mold for Karmax Corp., Brooklyn, N. Y., using Bakelite material. Retail price is 60¢ per unit. According to spokesmen from Karmax, sales for 1959 are expected to run in excess of 250,000 units.—END

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Monsanto Plasticizers	Polyvinyl Chloride	Polyvinyl Acetate	Cellulose Acetate	Ethyl Cellulose	Acrylic Type	Nitrile Rubber
Santicizer 141	C	C	SC	C	C	C
Santicizer E-15	C	C	C	C	C	—
Santicizer B-16	C	C	LC	C	C	C
Di-isobutyl Adipate (DIBA)	C	C	I	C	C	C
Diethyl Phthalate	LC	C	C	C	C	C
Dioctyl Phthalate (DOP)	C	SC	I	C	SC	C
Di-isoctyl Phthalate (DIOP)	C	SC	I	C	SC	C

C (Compatibility)—25-100 pts. per 100 parts resin. LC (Limited Compatibility)—10-50 pts. per 100 parts resin
SC (Slight Compatibility)—1-25 pts. per 100 parts resin. I (Incompatible)

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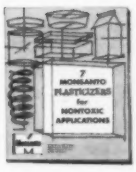
Monsanto Plasticizer	Non-Toxicity	Low Volatility	Grease & Solvent Resistance	Water Resistance	Low Temperature Flexibility	Low Cost
Santicizer 141	1	1	1	2	2	1
Santicizer E-15	1	4	1	3	3	2
Santicizer B-16	1	2	2	3	3	2
Di-isobutyl Adipate (DIBA)	1	3	2	3	1	2
Diethyl Phthalate	1	5	1	2	3	1
Dioctyl Phthalate (DOP)	X	1	3	1	2	1
Di-isoctyl Phthalate (DIOP)	X	1	3	1	2	1

X—Accepted for use with foods of high water content only.

NONTOXIC PLASTIC APPLICATIONS



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Problems with premix moldings – Part I

The first of three parts, this article deals with strength variations and voids—their causes and cures

By R. B. White† and R. S. Jackson‡

Reinforced "premix" materials offer properties never before available in plastics. Recently, advances in knowledge of how to process these compounds more reliably and at lower costs have added tremendous impetus to their wider acceptance. Table I, below, compares the more important properties of these compounds with those of other plastics. Note the outstanding combination offered by the high-filler, glass polyester premix.

Although practically unknown 10 years ago, polyester-glass premixes are today being successfully used in automotive heater housings, chemical pipe fittings, machine housing, large power-transmission insulators, and a host of other electrical insulating applications.

The technology of proper design for molding and compounding of these materials is not yet widely understood, and reports of numerous unhappy attempts to apply them have created a poor reputation for them in some areas. In consequence, many available product improvements which could be achieved through their use are currently being passed up—unnecessarily. The purpose of this article is to

*Reg. U.S. Pat. Off.
†President and ‡Chief Engineer, The Glastic Corp., 4321 Glenridge Rd., Cleveland 21, Ohio.

Table I: Premix property comparison with other plastics[a]

Property	ASTM test method	Glass-polyester[b] high-filler	Glass-polyester[b] high-glass	Gen. purp. phenolic	Rag phenolic	Asbestos-cement	Glass phenolic	Hard rubber (unfilled)	Polystyrene	H.D. polyethylene
Impact strength (Izod, ft.-lb./in. notch)	D256-56	5±2	12±4	0.4±.2	2.0±.2	0.4	12±2	0.5	0.3±.1	7±5
Flexural strength 10^3 p.s.i.	D790-58T	12±5	18±7	10±2	9±1	7±3	21±3	15	14±2	1.4
Tensile modulus 10^6 p.s.i.	D638-58T	2.0±.2	2.0±.2	1.0±.2	1.2±.2	—	2.8±.2	0.3	0.5	0.1
Water absorption, % (⅛ in., % in 24 hr.)	D570-57T	0.3±.1	0.3±.1	0.8±.4	1.0±.5	1.2±.8	.8±.4	.02	.04±.01	.01
Heat distortion, at 66 p.s.i., °F.	D648-56	400±100	400±100	300±40	280±30	> 400	> 600	140	175±25	165±10
Short-time dielectric strength, v./mil	D149-55T	380±40		310±110	300±100	45	260±110	470	600±100	530±80
Arc resistance, sec.	D495-58T	120±20	120±20	7±3	7±3	150±50	7±3	—	70±10	> 200
Moldability	—	Good	Fair	Excellent	Poor	Poor	Poor	Good	Excellent	Excellent
Machinability	—	Fair	Fair	Excellent	Fair	Poor	Poor	Good	Fair	Excellent
Cost-approx. (¢/cu. in. for comp'd)	—	3.0	4.0	1.2	1.8	0.5	5.5	1.3	1.0	1.5

[a]Data in this table were taken from publications of eight material suppliers and from the *MPL Encyclopedia* Properties Chart. Plus and minus limits define spreads possible with available formulations of each material.

[b]"High filler" = more than 50% filler; "High glass" = more than 25% glass. While these definitions are arbitrary, most compositions in use today fall into one of these classes or the other.

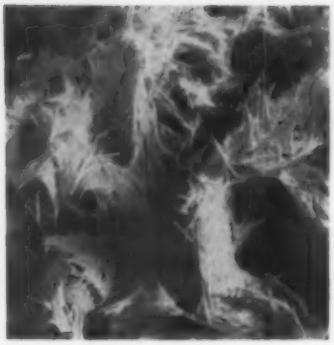


FIG. 1: Typical glass premix compound showing characteristic bunched condition. Extruded log or rope forms, although they **look** more uniform, contain bunches compacted into a single mass.

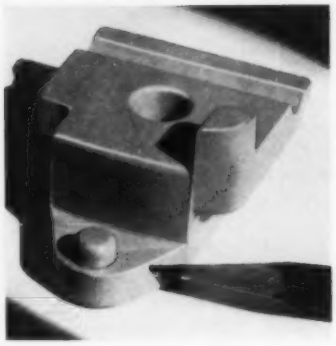


FIG. 2: In trolley-rail suspension block, stress of pulling against button tends to break off the ear section in tension at point indicated by the pencil.

analyze the major difficulties encountered in applying these new materials, and to show how they may be overcome.

Although the examples given here are based on glass-polyester-premix compounds formulated and manufactured by the authors' firm, trials have shown that all commercial glass premix compounds behave in much the same manner.

Strength variability

This characteristic of glass reinforced premix moldings is probably the most serious deterrent to their wider use. In thinking about the strength of premix moldings it is important to keep in mind that the finished product is not a homogenous, isotropic material but is a composite of three phases: 1) chopped fibers of glass or other suitable reinforcement, usually ¼ to ¾ in. long; 2) a rapidly heat-curing, rigid resin, usually polyester, epoxy, or phenolic, and 3) filler materials that give proper body and flow to the mix—usually inorganic powders such as calcium carbonate (whiting), silica (Diatomite), or kaolin (clay). The strength of the glass fibers, (about 200,000 p.s.i.) is many times the strength of the unreinforced resin/filler matrix, (usually less than 10,000 p.s.i.). Uniform isotropic distribution of the glass fiber reinforcement is impossible to achieve in parts molded from these materials. It will be observed (see Fig. 1, above) that the premix starts out in a swirled and bunched condition with wide variability in interlocking of the reinforced fibers. Nothing in the molding operation can be expected to improve this interlocking. Therefore, uniform results will be found only in sections large enough to average out these variations or in smaller sections where controlled flow gives a highly directional fiber orientation. Even in rather large pieces, stress is sometimes concentrated along very narrow lines. Where this is so, the mixing and molding procedures must provide ample reinforcement across those lines, or else failures may occur at stresses much lower than would be indicated by laboratory tests on the compound.

For any given piece with its

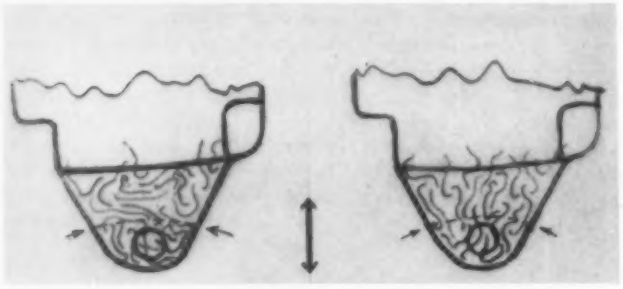


FIG. 3: Sketches of glass fiber distribution in two ears of molded trolley-rail suspension blocks of the type shown in Fig. 2. Center double arrow indicates direction of principal stress; dashed arcs above the buttons show approximate region of failure. Ear at right is much stronger because many more of the fibers run across the line of high stress.

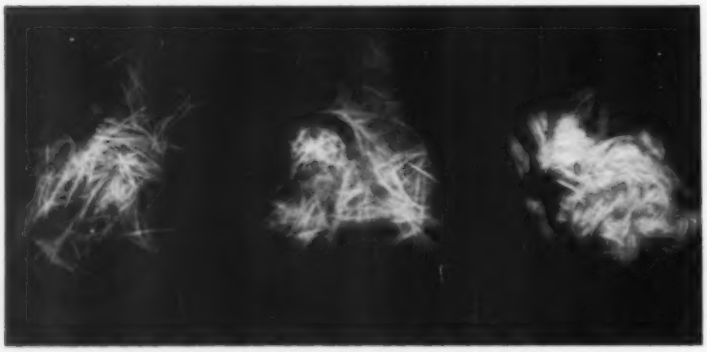


FIG. 4: Glass reinforcement breaks up rapidly with excessive mixing. Resin and filler have been carefully dissolved away from three samples of premix compound taken from a single batch of mix after mixing times of (left to right) 28, 33, and 40 minutes. Note shorter average fiber length, separated bundles, and increased fuzziness in samples to right.

particular system of loads there is (theoretically, at least) an ideal distribution of amount and direction of the strong glass fibers within the piece. In premix molding—in contrast to cloth and mat molding—the fiber distribution is much less controllable and systematic. Another factor peculiar to premix work is the mixing operation itself. This can, if it is not properly conducted, result in disintegration of the bundles of hair-like fibers that form the strong reinforcing strands. Such destruction of bundle "integrity," even if only partial, seriously reduces the strength of the molded pieces.

We believe that these two factors—poor distribution and loss of strand integrity—are mainly responsible for the wide strength variabilities observed in certain parts. Experience has shown that strength variations of 30% in tension and 50% in impact can be anticipated depending on the nature of the parts involved and the controls applied to compounding and molding. The variability is of two kinds: 1) variability among "identical" pieces, within and among lots, and 2) variability from one shape to another with the same compounds.

Widely variable test values have frequently been observed on different specimens of one piece, made from a single batch of compound molded by a single experienced operator under identical conditions. This is most likely due to the swirled and bunched structure of the premix compound, and is greatly accentuated by the usual molding practice in which the operator adds wads of material to bring each charge weight to correct balance. Since no fibers cross the interfaces between such wads and the bulk of the charge, those interfaces are planes of weakness analogous to weld lines.

The trolley-rail suspension block shown in Fig. 2, p. 118, illustrates the distribution problem. These blocks are used in part of this item showed a pull-pend a trolley rail whose flanges are pierced to accept the buttons on the ears. Initially, production parts of this item showed a pull-out strength varying from 570 to 950 lb. (in test lots of 50). While 570 lb. was adequate for the job, a revised molding technique was later adopted to get greater uniformity.

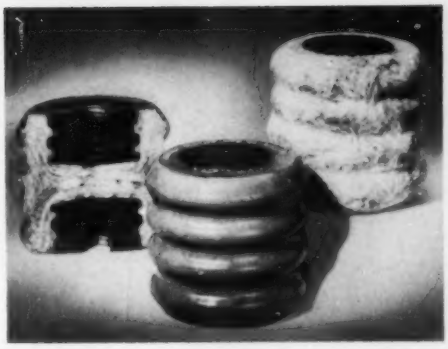


FIG. 5: Cross-section (left) of polyester premix molded insulator 3-in. in diameter (center) shows large (1¾-in. diameter) inserts used, as well as flow pattern of compound. Same insulator with resin dissolved away (right) shows quantity and distribution of glass reinforcement.

The force of the mold for this block acts downward on the top surface, and the charge was spread more or less evenly over the entire cavity. As the mold closed the charge was simply compacted downwards and there was little lateral flow, so the distribution of reinforcing fibers was about the same as that in the original charge of premix. The different orientations sketched in Fig. 3, p. 118, resulted, with corresponding differences in pull-out strength. By loading the charge in such a way as to induce more flow toward the ear, the right-hand orientation was favored.

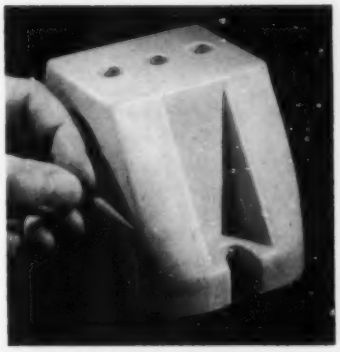


FIG. 6: Bridge-type bus support develops what appears to be far lower strength in the legs than other shapes in the same compound. Failure under cantilever loading occurs through the heavy section of the leg at point indicated by the pencil.

The other major strength factor, fiber integrity, depends on the magnitude of the shearing stresses developed during mixing and on the time of exposure to them. Thus it may be influenced by mixing time, evenness with which the fibers are added to the mix, speed of mixer blade, blade clearance, and uniformity of absorptivity of the filler, as measured by its oil-absorption value. This last factor affects the viscosity of the mix and

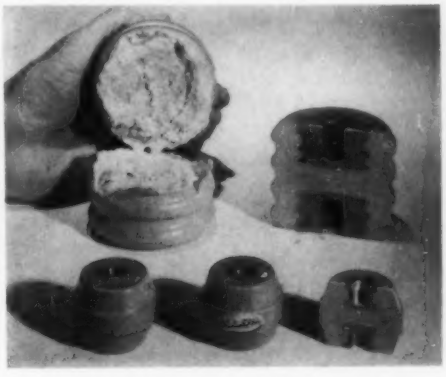
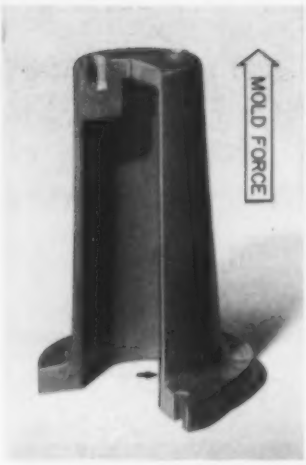


FIG. 7: Large insulator at upper left failed at right angles to the fiber orientation in center of part. See also cross-section in Fig. 5. The smaller insulator at bottom left failed by secondary circumferential tension, probably because of smaller size of the insert.



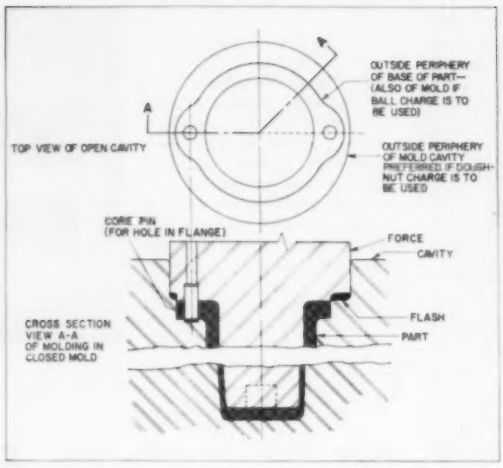


FIG. 8A, far left: Hollow post insulator used as high-voltage fuse clip support failed under cantilever testing at point indicated by the black arrow. **FIG. 8B:** Drawing of mold for same insulator, showing adequate shelf area provided for "doughnut" charge.

the shearing stresses developed.

Fig. 4, p. 118, shows how fiber integrity varies with mixing time. The 28-min. sample at the left is about right for developing the top impact strength of 12 ft.-lb. After 33 min. and 40 min., the strength drops to about 9 and 6 ft./lb., respectively. Clearly the strands are mostly whole after 28 min., but badly disintegrated after 40 minutes.

Variations in strength can also result from apparently innocuous changes in mix ingredients, such as a change from one pigment to another or one lubricant to another, even though these materials are used in very small percentages. In one carefully evaluated example, a change from cadmium oxide red to a much less expensive iron oxide red pigment dropped the average impact strength from 8.1 to 4.5 ft./lb! (The premix composition in this case was: resin, 30%; glass, 21%; filler, 47%; pigment, 1.0%.) Other colorants, such as copper oxide and Lithol dyes, have sometimes been found to cause similar reduction in physicals.

A good example of tensile-strength variation is found in the history of the stand-off insulator shown in Fig. 5, 119. This part normally tests between 7500 and 10,000 lb. pull. But in the course of regular production, control sampling over a six-year period the strength occasionally fell to much lower values, sometimes below 6000 pounds. The various causes of these drops were sometimes traced only with great difficulty and since they could not be anticipated, a very conservative control testing program was necessary. Recently, one such drop was traced to a "harmless" change from aluminum stearate to stearic acid as the internal lubricant. The same change had been satisfactorily made earlier in a number of other similar compounds to overcome a "soft spot" problem, but in this particular compound the change was definitely not satisfactory. Returning to the original lubricant restored the normal tensile strength.

We have not yet learned why this change in lubricant caused the drop in strength, but in investigating this case we did learn that almost any of these finely powdered lubricants, including aluminum stearate, could be used easily without soft-spot trouble by adding them to the mix at a later stage in the mixing cycle when the mix had enough body to break up any agglomerates in the lubricant. Possibly a higher initial resin viscosity in the "similar" compounds mentioned above had been providing enough shearing action to reduce the agglomerates earlier in the cycle.

Other such drops in strength have been caused by variations in cure time and temperature. Strength vs. cure on this insulator for one compound ran thus: 3 min. at 270° F., 7850 lb. (average); 3 min. at 250° F., 6100 lb.; 6 min. at 270° F., 8800 pounds.

Overmixing was responsible for excessive variation in another example, a lightning arrestor cap of relatively thin (3/32") wall section. When the impact strength of these caps suddenly dropped from 9.7 to 6.0 ft./lb., it was noticed (after much following of false leads) that the break was cleaner and less "hairy" than usual. Burning out the resin showed glass fibers resembling those at the right in Fig. 4, and

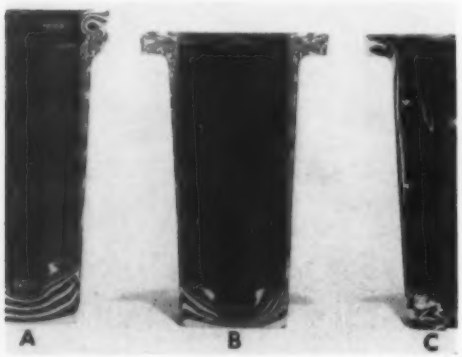
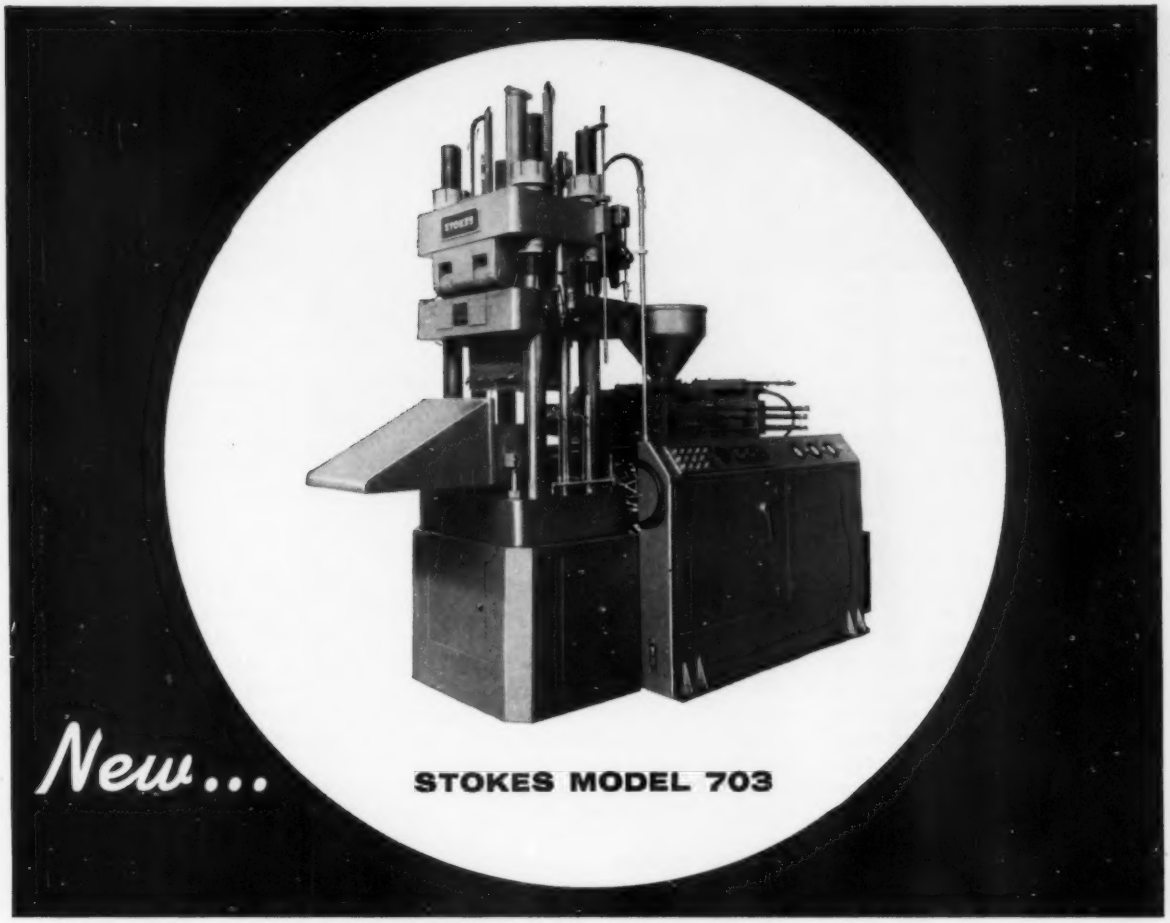


FIG. 9: When using "zebra sections" to observe flow behavior in mold, charge is made up of alternate colored layers.



The Truly Automatic 6-ounce Injection Molding Machine

The new Stokes Model 703 is the first machine of 6-ounce capacity to offer truly automatic injection molding to producers of larger parts such as auto tail lights, radio cases, fountain pen barrels, and similar pieces. It provides fast, economical production of big parts, yet is readily adaptable to smaller parts.

The 703 takes full advantage of its vertical design, combining vertical clamping with horizontal combing. Degated parts can be ejected into chutes, or deposited on a conveyor oriented as they were molded. Set-up and change-over is easy and quick—floor space is conserved—the mold is at an efficient working height.

All thermoplastic materials, including nylon, can be molded in the 703. An independently actuated positive nozzle shut-off prevents drooling. It also permits pre-packing the injection cylinder, precompression of the material at high pressure and faster filling. Center-point adjustment of the head insures keeping it absolutely level, preventing cocking of the mold. Automatic lubrication reduces wear and insures trouble-free service. Low pressure and controlled-speed closing provides greater safety to the mold—final clamping is fast, and at full pressure. Push-button type valves on the gages prolong their life.

Technical information and application data is available. Stokes Engineering Advisory Service will assist in the application of the new 703 to your own production needs. Call—or write—today.

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STOKES

investigation confirmed that this batch had been mixed too long. Now all our mixers have automatic cycle control. Mix time for each ingredient is controlled and recorded and the record becomes part of the batch file.

Strength vs. shape

The relationship between strength and shape in premix moldings is a complex one that we are only beginning to understand. Strengths measured on molded parts will vary from perhaps 125% down to 50% of the values obtained on test bars made of the same compounds. Here are a few examples: The insulator of Fig. 2 yields an average tensile strength of about 3500 p.s.i. in the ears, which compares very favorably with the value of about 3000 p.s.i. obtained on test bars of the same compound. The bus support insulator of Fig. 6, p. 119, on the other hand, breaks under cantilever loading at the point indicated by the pencil at a stress level of only 500 to 600 p.s.i. (assuming pure free-end truss conditions, which are, of course, not exactly met here.)

In many of these cases the variation can be clearly traced to differences in flow and fiber orientation with respect to the directions of high stress. In others, it may have to do with how evenly stresses are distributed around inserts, as in the insulators of Fig. 7, p. 119. In these the midplane stress at break was 1000 p.s.i. in the smaller insulator, compared to 1550 p.s.i. in the larger, but only the larger one broke along the midplane. The small one failed in circumferential tension around the insert, probably because there are very few fibers running in that direction and because the insert is relatively much smaller in diameter.

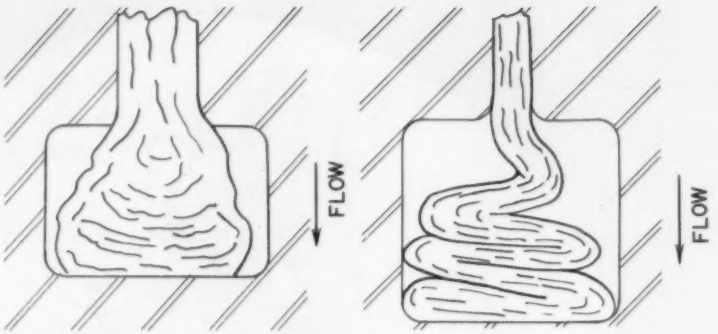

FIG. 10A, left, and **FIG. 10B**, right: Two different kinds of behavior—mushrooming and buckling—have been observed when a column of premix, flowing from a smaller into a larger mold cross-section, meets a transverse wall. Mode of behavior depends on strength of mix and free length and thickness of the column. In either case, however, most of the fibers assume positions cross-wise to the direction of flow.

Strength vs. flow

The hollow insulator shown sectioned in Fig. 8A, p. 120, provides an excellent example of how drastically physical properties can be influenced by molding technique. This part is molded in a conventional, semipositive compression mold sketched in Fig. 8B. Our preliminary calculations indicated that we might expect this structure to support a cantilever load on the lip of about 600 lb.; this seemed a safe margin over the customer's required minimum of 300 pounds.

The first sample parts, molded in the usual way from a ball preform placed in the bottom of the cavity, tested at only 200 lb., fracturing in the vertical section near the lip. Going to higher glass content seemed impractical, so we decided to make an example of this case and study the flow in the mold in detail. Examination by the usual sectioning and etching technique was vague and inconclusive, and progress began when engineer Albert Nochta suggested what we now call the

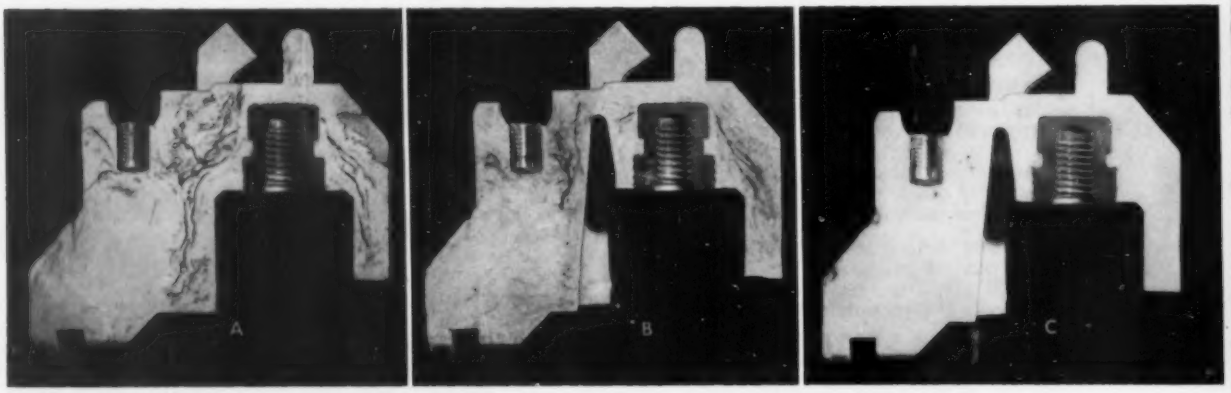

FIG. 11: Cross-sections of molded pieces, all stained with penetrating dye to emphasize defects. A) Original design in a standard formulation of glass-polyester premix (glass 28%, carbonate filler 40%, polyester resin 37%). Note characteristic internal cracks or voids. B) Modified design, showing how direct communication of internal cracks between inserts has been interrupted and heavy sections reduced to give improved dielectric performance. C) Revised formulation using synthetic fiber reinforcement. Note substantial reduction in internal voids and entirely different character of remaining voids.

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Standard Color Concentrates

Advantages: Use of messy dry colorants is eliminated • Color uncertainty and contamination possibilities are minimized Easier and faster color changes are possible • Mixing time is reduced • Inexpensive mixer hoppers can be used

Tenite Polyethylene *Standard* Color Concentrates offer molders a quick, clean and sure means to color polyethylene for injection molding or continuous extrusion. The cost is usually less than a penny a pound when used in a 1-10 ratio with natural material. Lighter or darker shades, of course, can be obtained by varying this ratio. Also, by combining concentrates of different colors in ratios determined by experimentation, other attractive colors may be produced.

Because these concentrates consist of natural polyethylene resin in which coloring agents have been thoroughly predispersed, pigment agglomeration is virtually eliminated. The result: excellent, uniform dispersion of the color throughout the molded product.

Standard color concentrates are stocked for immediate shipment in 50-pound multiwall bags and in 10-pound polyethylene bags. Other concentrates are also available (at slightly higher cost) in an almost unlimited range of colors to satisfy any color request.

To color polyethylene . . . . . .

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For prices and a set of molded 1-to-10 samples of our eight standard colors, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

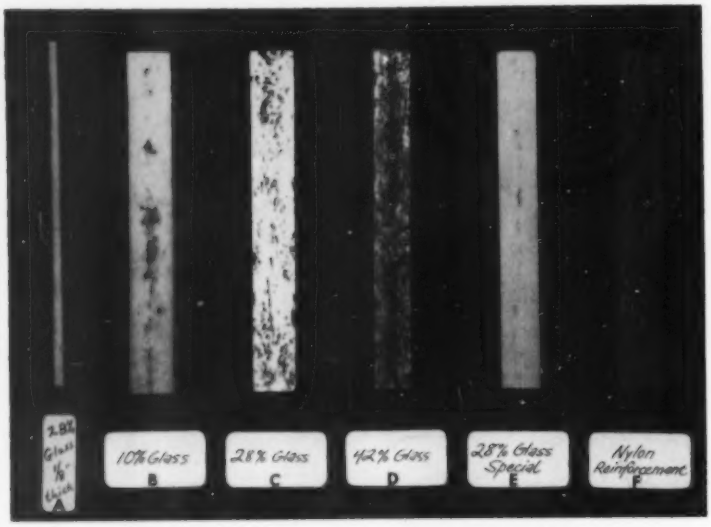

FIG. 12: Effect of reinforcement and composition on internal voids in cut slabs (dyed). Note reduced porosity in thin section A compared with C of same glass content. B, C, and D were from identical formulations except that high filler in B was replaced with glass in C and D. In E, proportions were same as in C but a special resin-filler system was employed. F was identical with C except that nylon fiber replaced glass.

"zebra section" technique—molding a charge made up of alternate black and white layers. Sections of such moldings are shown in Fig. 9, p. 120. While flow orientation is a well-known phenomenon, these sections show vividly how little mixing occurs between layers during molding. It is known, also, that the glass fibers tend to line up in the direction of fastest flow (i.e., of the velocity gradient), so it is reasonable to expect that very few fibers will cross the layer interfaces.

As a flowing premix moves from a region of large cross section to one of smaller cross section, the glass fibers become more and more oriented in the direction of flow. When it flows from a region of small cross section to one of larger cross section, the reverse is true. Orientation tends to occur in the directions perpendicular to flow.

We have observed, also, two different kinds of behavior when a moving column of premix flowing from a smaller into a larger cross section meets a transverse wall—mushrooming and buckling, shown schematically in Fig. 10A and 10B, p. 122. The mode of behavior depends on the strength of the mix and the free length and thickness of the column, but note that most of the fibers end up in positions crosswise to the direction of flow in either case. Mushrooming is the chief action in the lower corner of Fig. 9C, while buckling appears in the upper wall area of the piece shown in Fig. 9A.

Since what we needed in this piece was to avoid the wavy, and consequently weak, fiber orientation in the heavy wall sections near the lip as seen in Fig. 9B, it seemed reasonable to try to charge the mold in such a way as to obtain downward rather than upward flow in that region. This was done by giving the charge a doughnut shape and placing the doughnut on the upper shoulder of the cavity. (See Fig. 8B.) The force was allowed to penetrate the doughnut before flow began. This procedure yielded a much improved orientation, as Fig. 9C shows. Parts so made tested at 450 lb.—a 125% increase, and well above the customer's minimum!

FIG. 13: Note thin wall sections and long flow path required to fill molded glass premix coil form. Pencil indicates corner section shown enlarged in Fig. 14, opposite.

Internal voids

Heavy sections of glass premix moldings normally produce a conspicuous degree of internal voiding (see Fig. 11A, p. 122. This condition appears to have little or no effect on the critical physical properties in most applications, but for certain electrical requirements, especially corona resistance and low radio noise level, it can be a serious obstacle, as will be seen later. Also this characteristic makes these materials difficult to use as covers or closures under gas or liquid pressure, especially where drilled holes or other machining is involved.

The fact that these internal voids have little effect on physical properties has been demonstrated in numerous comparisons made in the laboratory and has been checked out in such parts as the bus support in Fig. 6 and the insulator in Fig. 7, where void free compositions show no improvement in physical strength.

Many different approaches have been explored on different parts from time to time in seeking satisfactory answers to this internal-void problem. These have included: 1) higher pressure on the compound during molding; 2) a wide variety of different polyester resins; 3) nonpolyester resins such as epoxies or diallyl phthalate; 4) different compositions ranging from very dry to very gooey; 5) different fillers ranging from calcium carbonate to amorphous silica to expanded mica; 6) a variety of catalyst systems and cure cycles; 7) nonglass reinforcement such as sisal or nylon; 8) flake-glass reinforcement; 9) more conventional molding compounds like general-purpose phenolic; and 10) modified

part design to core material out of the area between inserts, as shown in Fig. 11B.

With some of these changes, such as 5), 7), and 10), some improvement can usually be accomplished. Wood-flour-filled phenolic, 9) gives excellent dielectric characteristics but is often unsatisfactory because of its brittleness and poor tracking resistance. Some epoxy and DAP compounds, 3) show good density and dielectric performance but are difficult to mold and very expensive. Other promising approaches like extra pressure, and resin variations, have usually produced no apparent improvement.

We believe internal voids result from the fact than an outer shell, composed of the glass-reinforced material nearest the mold surfaces, cures first. It becomes strong enough to resist the natural shrinkage of the polyester resin in the remaining central portion of the part as it cures, thus causing voids at the center. Since the strength of these materials is highly directional, depending on the orientation of the glass fibers in any given area, these voids occur as long thin cracks running parallel to the glass fibers in that area. This is seen quite clearly under a microscope in heat-aged samples where the pattern of fiber orientation in the molding is plainly visible, and will be discussed in more detail later.

In nylon-reinforced compounds, the outer shell is not so rigid, and tends to be pulled inwards as the center cures. Also, the greater fuzziness of nylon fibers results in more interlocking among them than among glass fibers. Thus these compounds (see Fig. 11C) are almost completely free of such voids. They are also found to have much greater mold shrinkage than glass reinforced compounds for the same reasons.

Compounds of other synthetic and organic fibers also show the low void content of nylon reinforced materials. Other compositions with fuzzy fibers, such as asbestos, or fibrous talc, or with nonfibrous materials such as flake glass or wood flour, will also show marked improvement in this characteristic, but at a sacrifice of heat resistance, dielectric properties, or impact strength. Carefully controlled cure cycles with proper catalyst systems and controlled resin reactivity, together with a selection of proper formulations based on a broad area of experimentation with the different variables involved, can achieve a considerable improvement in internal voiding where glass reinforcement is a requisite.

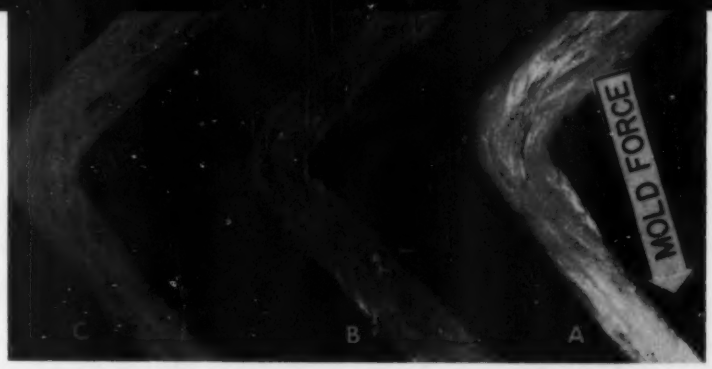

FIG. 14: Voids and cracks in corner section of coil form (Fig. 13), seen under microscope and without dye. A) Standard "high-glass" premix. B) High-filler compound. C) High-glass "special" as in E, Fig. 12.

Thus we conclude there is no one simple answer to this vexing problem, but rather, a suitable answer must be developed in terms of the particular requirements of each part.

Dielectric strength variability

A designer seeking high electrical strength recently asked us, "Is it possible that *adding* material to the thickness of a part could actually *decrease* the dielectric breakdown voltage?" Our answer —to his considerable surprise— was "Yes." The above discussion of voids should make this answer fairly obvious. The air which is present in such voids may have a dielectric strength of only 25 v./mil, as against about 300 v./mil for the voidless molded premix.

Since heavy sections are much more prone to gross internal voids than thin sections, as Figs. 12A and 12C make clear, they may actually have lower over-all dielectric strength than thinner sections of the same material.

The best route to improved dielectric strength is, therefore, not usually to increase wall thickness, but to reduce glass content if possible or otherwise revise the mix formulation. Since high-filler (low-glass) materials can be employed in much heavier thicknesses without the hazard of voiding, it follows that increased sections of the slightly weaker low-glass compounds often *can* be used in place of thin sections of high-glass material. This increased section can achieve the same load-bearing capacity and better dielectric strength while the lower cost offsets the greater amount of material required. For once it *is* possible to have one's cake and eat it, too!

For some applications a still better path to improved dielectric is proper selection of the *type* of ingredients used in the compound. Figure 12, p. 124, illustrates the effect of composition on internal voiding. Note the markedly adverse effect of increasing glass content, and the improvement possible in high-glass material by proper formulation. The "special" material shown at "E" in the photo employs a proprietary resin-filler composition developed especially for high dielectric requirements as illustrated in examples given below.

While the dielectric breakdown strength of the insulators in Fig. 5 is over 35,000 v. and this is far more than the top service requirements of 700 v. for this part, note that this is only 62 v./mil on the 9/16-in. section between the inserts shown, compared to the figure of 300 v./mil normally advertised for these materials, and easily attained on 1/8-in.-thick ASTM test slabs. In the heavier sections of this part, and with the contoured shape into which the compound is required to flow, lower values must be expected than the ones found on thin flat test slabs. (*To page 128*)

Greater latitude in radio cabinet design is permitted by the higher heat resistance of CYMAC® 400 polymethylstyrene plastic which will withstand continuous service at temperatures to 212°F without distortion. This property, plus its ready adaptability to complex molding and its excellent flow and color characteristics, was one of the reasons it was selected for the cabinet of the RCA Victor table radio, *The Burgess*, illustrated here.

Additional advantage of CYMAC is that it has sufficient flexibility for back cover to be secured without fasteners: a simple snap-fit reduces cost, speeds assembly, and facilitates disassembly if required. The following properties indicate CYMAC 400 is an ideal material for radio cabinets and similar housing requirements:

Resistance to heat, °F (cont.)	212
Heat distortion temperature, °F	213
Molding shrinkage, in./in.	.0046
Specific gravity	1.02
Flexural strength (1 in./min crosshead speed)	12,500
Impact strength ft/lb/in. of notch (½ x ½ in. notched bar, Izod Test)	.30
Rockwell hardness	76M
Dielectric strength, short time, ⅛ in. thick volts/mil, 1/16 in. disc	890

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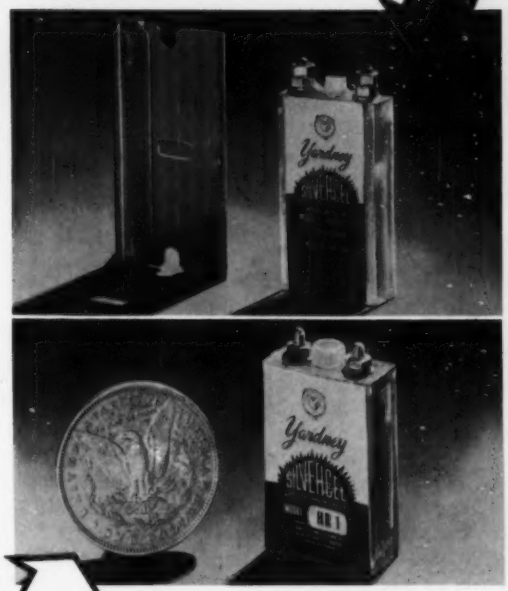
World's smallest and lightest rechargeable battery cell, shown here with razor blade, is Yardney Electric Corporation's HRO1 Silvercel®. Designed primarily for use in instrumentation and telemetering packages for missiles and rockets, it has a 3 amp peak pulse discharge and weighs less than one-seventh ounce — thanks in great part to lightweight molded CYMAC SUPER* 201 thermoplastic case and cover.

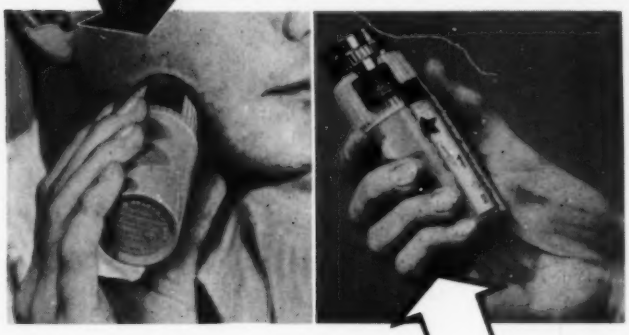
*Trade mark



Another Yardney silver-zinc cell is shown here with a silver dollar for size comparison. This HR1 Silvercel® delivers a 45 amp peak pulse discharge yet weighs only ¾ ounce. CYMAC SUPER 201 methylstyrene-acrylonitrile copolymer was selected because of its:

- Low specific gravity (1.06)
- Exceptional combination of high tensile (11,000 psi) and high flexural (16,100 psi) strengths
- Heat resistance (distortion point 211°F)
- Complete resistance to concentrated potassium hydroxide electrolyte
- Excellent injection molding characteristics, transparence, resistance to crazing, and ease of solvent-sealing covers to cases.

New cordless electric shaver features light weight (two ounces), damage-resistant case of CYMEL® melamine plastic, designed by Raymond Loewy Associates. This smart-looking Universal shaver operates anywhere on ordinary pen light or transistor batteries. The CYMEL case is contoured to fit the hand, corrugated at the top for a natural, easy grip.



Battery and motor unit are secured by light press fit in housing compression-molded of CYMEL 1079 melamine molding compound. CYMEL resists breaking, chipping, scratching, perspiration, and corrosion from shaving lotions and battery chemicals. It provides a rich look and warm feel. Color, molded in, can't chip or wear off. Molded by Holyoke Plastics Company, Holyoke, Mass., for Landers, Frary & Clark, New Britain, Connecticut.

For more complete information on these and other Cyanamid Plastics, send for the latest copy of our catalog, *"Molding Compounds and Resins."*

New polyester resin from Cyanamid
LAMINAC® Resin 4106 for dual-spray applications

Cyanamid's new polyester resin, LAMINAC 4106, is rigid in type, with medium reactivity and low thixotropic viscosity. It is made especially for application by dual-spray methods. When so used, the resin is divided into two portions, one containing catalyst, the other promoter, both of which are stable until mixed as converging streams enter the mold. Low viscosity and slightly thixotropic characteristics promote rapid wetting of glass fibers and freedom from sagging on vertical molded surfaces. Cure is rapid, permitting production of multiple parts per day from a single mold.

TYPICAL CHARACTERISTICS-LAMINAC 4106

Viscosity*	5 poises
Specific gravity	1.1
SPI cure characteristics	
Gel time	3½ minutes
Time to peak temperature	5½ minutes
Peak exotherm temperature	400°F

*Brookfield Model RVF, spindle #1, 10 rpm 77°F

FIG. 15: Close-up of coil form surfaces, after penetrating dye treatment. A) Same part as Fig. 13 but molded of standard high-glass compound with no pigment; note cracks exposed by penetrating dye. B) Surface of same part molded of "special" premix as E, Fig. 12.

The dielectric breakdown strength between inserts in the blocks in Fig. 11A is also below flat slab values, but it is worth noting here that these parts gave nearly double the dielectric breakdown values of impact phenolic materials under alternate 72-hr. exposure to humidity and increasing high voltage.

In certain very-high-voltage applications, the dielectric failure of parts may occur through prolonged action of electrical corona at voltages far below those at which short-time dielectric failure would occur. In such applications the "corona-start" test is useful. In this test the operator watches an oscillogram of the wave pattern of the applied voltage. At a certain critical voltage, the first small corona discharges occur, and easily recognizable "pips" appear in the wave pattern. This voltage is known as the "corona starting point." Such corona can occur first externally or internally, depending on the design of the part and the quality of the insulation. If internal voids exist between inserts in a molding, such corona discharge will probably develop first in these areas, especially if any such voids are immediately against the surface of an insert. The blocks of Fig. 11A, for instance, showed corona-start voltages below 5 kv., while the experimental nylon blocks of Fig. 11C tested above 20 kilovolts.

Dielectric in thin sections

While the internal voiding condition can be materially improved in these materials by reducing wall thicknesses, it is curious to note that many thin wall pieces also show poor dielectric strength in relation to normal advertised test values for these products. This is usually because glass reinforced materials behave quite differently when molded into contoured parts than in plain flat test slabs.

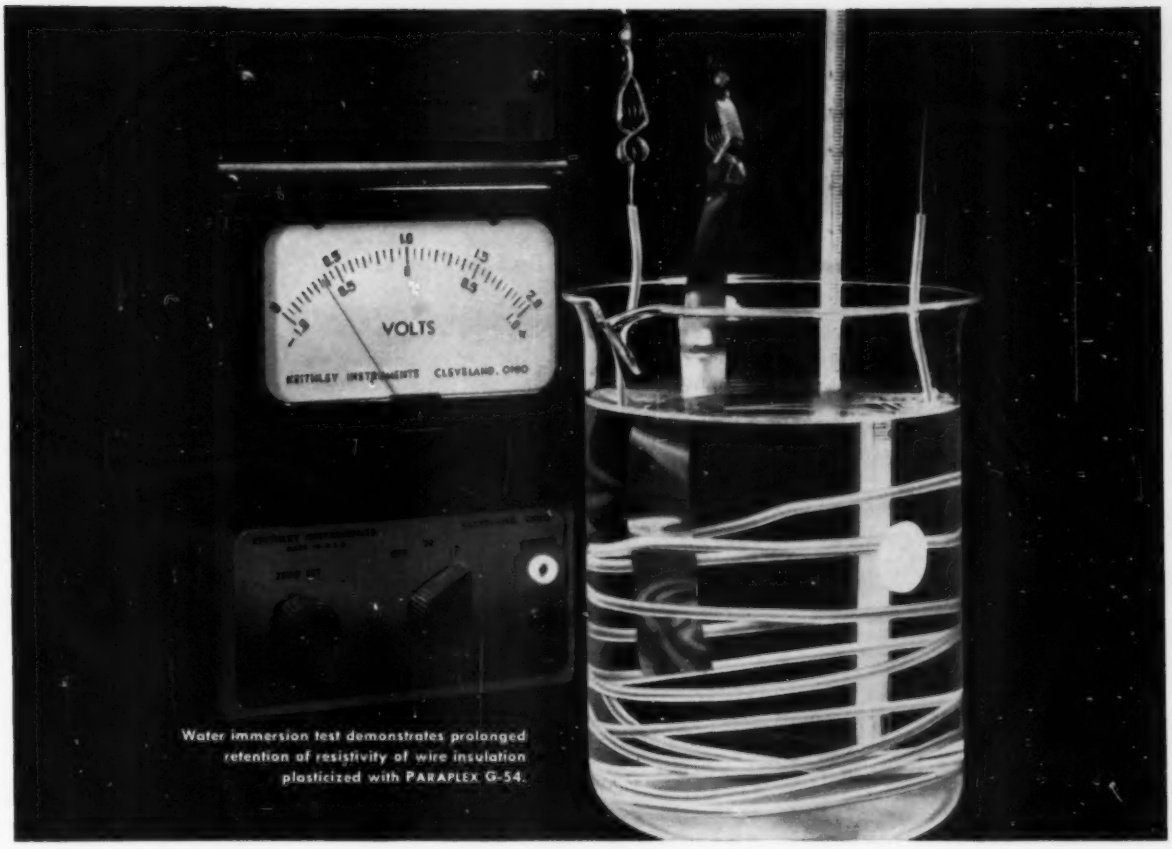
In the coil form shown in Fig. 13, p. 124, for instance, dielectric strengths of 50 to 100 v./mil were observed on a high percentage of such parts made from a standard, high-quality glass premix compound, and corona-start values were about 15 kilovolts. The magnified corner section of Fig. 14A, p. 125, and Fig. 15A, above, show that these low values were obtained because of voids and surface cracks. These defects undoubtedly arise from the great amount of flow needed to fill this extended, thin-wall shape, and the sharp corners around which the mix must flow. With such shapes the reactivity of the resin catalyst system must be tailored so that the flow is complete and the material is in place before any gelation takes place. Also, there must be intimate microscopic bonding between the resin and the glass fiber reinforcement. It is well known that when the bond at the resin-glass interface is poor, the bundles of glass fibers act as little capillary tubes. This is particularly noticeable in its effects on electrical properties. The finish applied to the glass, the resin selected, the type and amount of internal mold lubricant are all vital factors in the proper formulation of a satisfactory material.

This explains why a material which is ideal for mechanical applications because of its high strength and short molding cycles may not do well in critical electrical applications. Long before the short-time physicals have been affected by poor fiber bonding or internal cracks, dielectric strength may become severely impaired.

The special premix formulation described earlier shows intimate resin bonding to the glass fibers under the microscope as seen in Fig. 14 and has proven very satisfactory in these parts. It yields 16 to 19 kv. dielectric strength in this molded shape, or over 150 v./mil. The corona-start voltage is also high, well above 20 kilovolts.

Most of the preceding discussion has been limited to materials tested in the as-received condition. Actually, the electrical strengths after moisture conditioning and heat aging are often more important to the designer, since he is interested in the performance of the part under the varying atmospheric conditions found in actual service. While the same principles discussed above apply, the important thing for the designer is that he must test the parts *after* subjecting them to the appropriate environmental conditioning. Materials that test well as-received may literally fall apart electrically after relatively mild environmental conditioning. Designers should also keep in mind that the best electricals are usually obtained either with lower-glass-content materials or with compounds that have been mixed so intensively that the glass fibers are largely fuzz. Such compounds are *not* the strongest, and the temptation to specify maximum physical properties in electrical components often defeats the important need for maximum electricals. It is also instructive to observe (see Table I) how relatively insensitive most physical properties are to changes in glass content—within the practical range. Best performance is usually achieved through an intelligent compromise.—END

Next installment: Cracks in premix moldings and what to do about them.



Water immersion test demonstrates prolonged retention of resistivity of wire insulation plasticized with PARAPLEX G-54.

PARAPLEX G-54...for vinyl insulation that resists high humidity at high temperatures

Vinyl insulation plasticized with PARAPLEX G-54 gives admirable service under "wet" conditions. This high molecular weight polymer keeps vinyl compounds flexible after prolonged high-temperature aging, as well as free from plasticizer exudation on exposure to high humidity at high temperatures.

In addition, compounds plasticized with PARAPLEX G-54 show good volume resistivity . . . high dry-dielectric strength . . . retention of dielectric strength after immersion in water . . . resistance to copper corrosion . . . resistance to plasticizer extraction by oil and soapy water . . . resistance to plasticizer migration into lacquers, baked enamels, polystyrene, and rubber . . . resilience . . . good low-temperature flexibility . . . and exceptional compatibility with epoxide plasticizers.

MONOPLEX S-90 is another Rohm & Haas plasticizer which imparts outstanding electrical characteristics to polyvinyl chloride. This high-molecular-weight, monomeric plasticizer provides high insulation resistance at elevated temperatures (both dry and after immersion in water), retention of tensile strength and elongation after high-temperature aging, and low plasticizer volatility. Write today for more information on these products and the other Rohm & Haas PARAPLEX and MONOPLEX plasticizers.

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Chemicals for Industry

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THE RESINOUS PRODUCTS DIVISION

Washington Square, Philadelphia 5, Pa.

PARAPLEX G-54

Custom-made machine pays off on difficult jobs

Versatile 16-oz. automatic molding machine was designed to custom molder's specifications

By S. E. Tinkham*

With the wide variety of thermoplastics available today, it is more than ever essential that injection-molding machines be versatile enough to handle these materials efficiently. Also, designers and molders are recognizing that, with proper machine and mold engineering, it is possible to mold very complex shapes economically. Inserts can be molded in; flanges, projecting surfaces, and undercut curves can be molded; sprues can be broken free if the injection nozzle is withdrawn before or as the mold is opened. In some moldings, such as the card holder shown in Fig. 1, below, several or all of these factors are involved.

In ordering our new 16- to 20-oz. machine from Lombard Governor Corp., Ashland, Mass., we wanted a fully automatic machine capable of dealing with a large variety of molds, especially those presenting complex coring problems. At the same time, the machine had to be capable of molding nylon-6/6, and it had to protect molds against operators' errors and against piece-ejection failure during automatic operation. We wanted all the circuits needed to accomplish these motions to be controlled by a single bank of selector switches.

Specifically, it was required that the machine be capable of inserting the cores into the mold either with the mold fully closed (and extracting them before the mold began to open) or with the mold sufficiently closed to have cleared the ejector pins but still open (and extracting them after the mold had partially opened but before it had opened far enough to bring the ejector pins into play). In either case, or when operating a mold without cores, it was also necessary that inserts could be placed manually, either at the full open mold position or at an intermediate position. Furthermore, when operating with cores inserted and extracted at a partially open position, it had to be possible to place the inserts either before or after the cores had moved into position. Again, it had to be possible, if necessary, to permit operator supervision of the core extraction before the mold opened sufficiently far to engage the ejector pins.

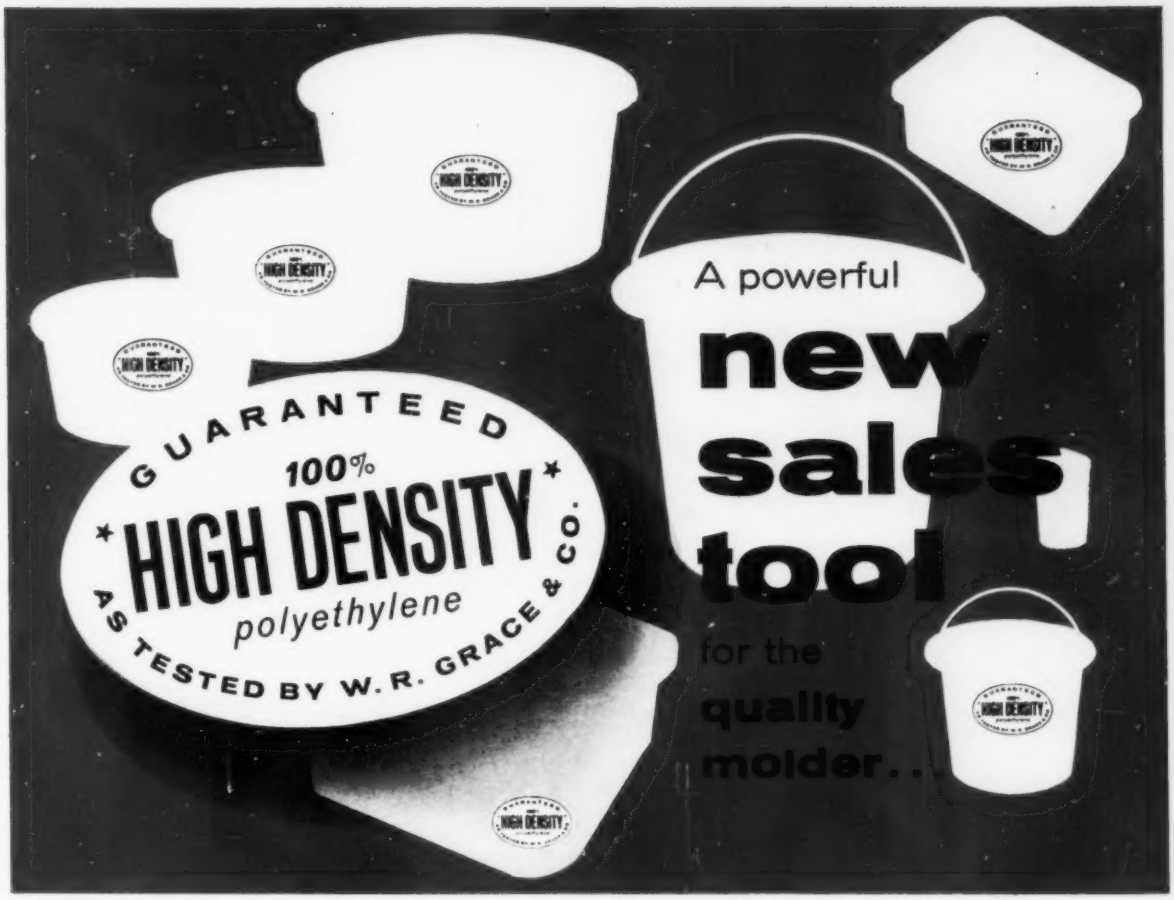
It was, of course, also required that the primary operations of the machine could be carried out manually, for setting up or for clearing the machine in case of an operator error or a component failure; and that the usual provision for plunger advance and a varying number of stuffing strokes be made.

4098 cycles possible

To meet these needs, it was necessary to provide 12 separate two-position selector switches. With 12 switches, the machine is nominally capable of being set up for 4098 different cycles. (This does not include switches or valves used for manual cycling.) Generally, the ideal of one switch for one purpose has been closely realized; in only one or two instances is it necessary to check more than the obvious minimum

FIG. 1: Three views of complicated holder for business-machine cards, produced on custom-made injection machine described in accompanying article. Square holes at bottom, notches, and curved back were all formed on automatic cycle by retractable core. Holes in ears were drilled later.

*Executive Engineer, Boonton Molding Co., Boonton, N. J.



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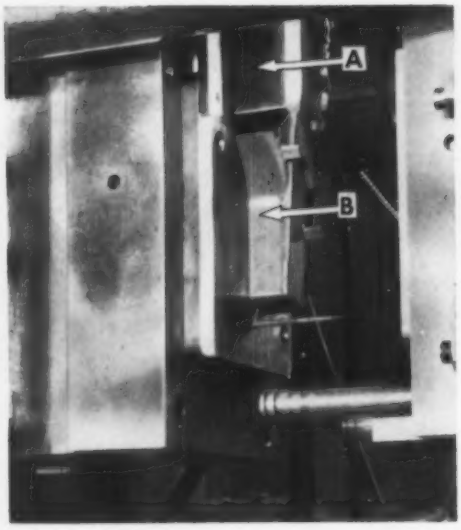

FIG. 2: Core (A) for inside of card holder (B)—see also Fig. 1—was withdrawn automatically by hydraulic cylinder (located above mold) after mold had opened part way. Note bottom-center gating. Machine was built by Lombard Governor to Boonton specs.

of switch positions to ensure realization of the desired cycle.

The control design problem was further complicated by the fact that motions which would be disastrous in some cycles are required in other cycles—for example, the motion of the mold in the opening direction with the cores in place. Two things add still more complexity to this particular situation: 1) Whatever arrangements are made must be, insofar as this is possible, fail-safe; 2) Error on the part of the operator, such as opening the door at the wrong time or accidentally pressing the stop-button, must be guarded against, without impairing the normal provisions for operator protection.

Complex automation

The most complicated cycle possible without intervention of an operator is the following:

Mold closes at the expiration of a timed interval; mold stops at a preset, partially closed position; cores are inserted; mold closes fully; mold locks closed under full pressure; nozzle advances to injection position; ram moves forward under booster pressure; ram stays in forward position under "holding" pressure for a timed interval; ram moves backward to its extreme position, discharging a weighed hopperful of granules into the heater neck; ram makes up to three partial or "stuffing" strokes to push the granules into the heater body, and stops at an intermediate position (the "advance" position); after a timed interval the nozzle moves back a preset distance; the mold opens partially; the cores are extracted; the mold moves back to the fully open position, the ejector pins pushing the work out; the timing of the mold-open interval begins.

This cycle may be modified to cause the cores to move in after the mold is fully closed and locked, instead of at the intermediate position (in which case they are moved out after the nozzle has retracted and before the mold begins to open). In this modification, no stop is made at the intermediate mold position, either on the opening or on the closing strokes of the mold cylinder.

Operator participation to the cycle can be added in the following independent ways:

1) The automatic cycle can be made to stop just before the insertion of the cores; then the operator opens the door, places any required inserts, and recloses the door. The cycle then proceeds as in the fully-automatic case.

2) The automatic cycle can be made to stop just after the insertion of the cores, the operator and cycle then proceed as above.

3) When no cores are used, the cycle can be made to stop when the mold reaches the chosen intermediate position during the mold-closing stroke, so that inserts may be placed; the cycle proceeds when the operator recloses the door.

4) The cycle can be stopped after the cores have been extracted; the operator may then satisfy himself that the cores have cleared, and cause the cycle to resume by opening and reclosing the door.

5) The cycle can be stopped when the mold is fully open; the operator may then remove the work by hand, or place inserts, or both, and start the cycle without waiting for an interval to be timed, by reclosing the door.

If the intermediate mold position stop is not required either for core movement or for placing inserts, it may be eliminated entirely in this cycle just as in the fully automatic cycles.

The arrangement of the circuits throughout is such that a programmed motion of the machine cannot be made until the preceding one is completed; there are no simultaneous movements in any normal cycle, except that the handling of the door by the operator may coincide with some other function. This provision eliminates the hazard of mistiming operations because of abnormal conditions of any kind.

A typical example of the employment of the pre-positioning of the movable platen and mold core movement is the molding of the business-machine-card case of Fig. 1. This case is made of flame-resistant cellulose acetate, and weighs 8.34 oz. with section thicknesses ranging from 60 to 300 mils. Its interior, whose curved back surface is located perpendicular to the parting plane, is formed by a core that enters from above. The cycle, measuring about 1¼ min. overall, is divided as follows: a) the mold opens to pre-position; b) the core is withdrawn (Fig. 2, above); c) the mold-opening stroke is completed to eject the case; d) the mold is closed to a predetermined position; e) the core descends into molding position; f) the mold closes completely and filling begins.

This versatile injection machine, which has enabled us to bid successfully for several complex jobs that would be impossible or costly to mold with standard machines, is returning its extra cost at a very satisfying rate.—END

Cost savings result from the wide choice of alternative methods made possible by the versatility of Marblette materials, especially for large tools. Here a "giant" foam core is lowered into a mold, for facing with Maraset epoxy laminating resin.

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PLASTICS* TECHNICAL SECTION

MATERIALS • PROPERTIES • TESTING METHODS AND INSTRUMENTATION • STANDARDS • CHEMISTRY

Correlation of peroxide half-life with polymerization

By Orville L. Mageli†, Suzanne D. Stengel†, and Donald F. Doehnert†

Excellent correlation is obtained when organic peroxide activity based upon half-life data is compared with activity based upon gel time results in either diallyl phthalate monomer or in a basic polyester resin, provided that the peroxides are compared within groups of the same type of molecular structure. Hydroperoxide structures tend to give somewhat poorer correlation than other groups, probably because they are susceptible to activation or inhibition by the system. Of the hydroperoxide structures the ketone and aldehyde peroxides give the poorest correlation, since they not only contain hydroperoxide groups but also are usually mixtures of labile products which can, upon dilution, undergo dissociation and rearrangement to yield either more active or more stable peroxides.

The results substantiate the importance of half-life data as the first step in the selection of an organic peroxide initiator. The gelation results in monomeric diallyl phthalate and in the known basic polyester resin should be useful as models to give further selectivity in the choice of the most suitable polymerization initiator for any system.

Previous polymerization studies reported from this laboratory were concerned with the comparison of four commercially available diacyl peroxides in the bulk polymerization of styrene (1)[1] and with the evaluation of organic peroxides and peroxide compounds as catalysts for polyester resins (2). In a more recent paper (3) organic peroxide half-life data obtained in an inert solvent were used to establish a scale of organic peroxide activity. This scale listed commercially available organic peroxides in an order based on temperatures corresponding to a selected half-life value. It was realized that, because the half-life study was only the first step in the evaluation of an initiator (4) and did not take into consideration the effects of more reactive media or the activity of the radical formed, some actual polymerization data were needed.

*Reg. U. S. Pat. Off.

†Lucidol Div., Wallace & Tiernan, Inc.

[1]Numbers in parentheses link with references at end of article, p. 172.

Presented in part at Organic Peroxide Symposium, sponsored by the Northeastern Section, American Chemical Society, which was held at Boston, Mass., on Mar. 13, 1958.

Gel times correlated

The present work summarizes a study of peroxide-initiated polymerizations of cross-linking systems, in which the measurement of gel time has been used to establish orders of organic peroxide activity in two cross-linking systems. The gel time results have been correlated with half-life data.

The gel times were measured with a gel time meter (5), an instrument designed and reported on some years ago (6). This device measures the time required for a resin to reach that point in cross-linking polymerization at which indefinitely large networks of polymer molecules are formed and an abrupt change in viscosity occurs (7). When the logarithm of the reciprocal of gel time is plotted against the reciprocal of the absolute temperature, approximately straight line curves are obtained (8). In the present work two cross-linking polymerization systems were used; first, a known, basic polyester resin, and, secondly, a purified monomer, diallyl phthalate. Concentrations of peroxide were kept equivalent within each system on the basis of molar concentration of peroxide groups, that is, the active oxygen concentration was held constant. Thus, peroxides could be compared on the basis of the rate of formation and activity associated with the free radicals produced by cleavage of the peroxide linkage. Order of activity based on gel times could be compared with that based on half-life data.

Peroxide half-lives in benzene

In the half-life data used in this work two other commercially available organic peroxides have

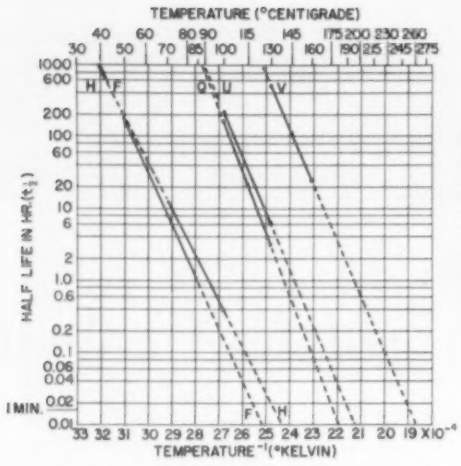


FIG. 1: Half-life—temperature curves for various organic peroxides in dilute benzene solutions. **F:** acetyl peroxide; **H:** benzoyl peroxide; **Q:** *t*-butyl hydroperoxide-70; **U:** Di-*t*-butyl peroxide; **V:** *t*-butyl hydroperoxide-90.

been included which were not previously reported (3). These are acetyl peroxide (sold as a 25% solution in dimethyl phthalate) and *t*-butyl hydroperoxide-90 (*t*-butyl hydroperoxide of 90% minimum assay and free of di-*t*-butyl peroxide). These two peroxides are included in Table I, below, which lists an order of organic peroxide activity based on temperatures corresponding to the 10-hr. half-life values obtained in dilute benzene solutions. Figure 1, above, shows selected half-life data curves which include these two peroxides.

It is evident from the data in Fig. 1 and Table I that there is a considerable difference in the half-life values obtained for *t*-butyl hydroperoxide-70 ("commercial *t*-butyl hydroperoxide") (3) and *t*-butyl hydroperoxide-90 which is free of di-*t*-butyl peroxide.

Since half-life studies had indicated that the presence of such impurities as inert solvents or plasticizers had little effect on the half-life values, the large discrepancy in the results for the two *t*-butyl hydroperoxides required further investigation. It was found that di-*t*-butyl peroxide decomposing in the presence of *t*-butyl hydroperoxide, even in dilute solutions in benzene, had a marked accelerating effect upon the decomposition of the hydroperoxide.

It was also found that the accelerating effect was not limited to *t*-butyl hydroperoxide but was also present in mixtures of cumene hydroperoxide and di-*t*-butyl peroxide. A series of half-life determinations was made at 145° C. and the results are summarized in Table II, opposite. It is readily seen that the decomposition rate of the di-*t*-butyl peroxide is essentially constant in each mixture, while the hydroperoxide decomposition is greatly accelerated. *t*-Butyl hydroperoxide in the presence of two moles of di-*t*-butyl peroxide, in dilute benzene solution, decomposes a thousandfold faster than it does alone in benzene solution. A similar acceleration of *t*-butyl hydroperoxide decomposition by di-*t*-butyl peroxide was found previously in vapor phase decomposition studies and was concluded to be due to an induced decomposition caused by the attack of methyl radical (from the di-*t*-butyl decomposition) upon the hydroperoxide (9). At 1:1 molar concentrations of di-*t*-butyl peroxide and *t*-butyl hydroperoxide, the decomposition rate of the hydroperoxide at 98.5° C. was of the same order as that reported for the decomposition of *t*-butyl hydroperoxide in dodecane solution, when the solution was swept free of gaseous products by helium (10).

It will be shown in the polymerization studies reported that this accelerative effect may or may not be detected, depending upon the polymerizing system being studied.

Gel time measurements

The time required for the cross-linking system to reach the gel point, that sudden change in viscosity associated with a rapid increase in polymer size due to cross-linking, is conveniently measured by the gel time meter

Table I: Decomposition temperatures of organic peroxides in benzene at a selected half-life ($t_{1/2}$) value

Peroxide	*Temp. for $t_{\frac{1}{2}}$ = 10 hr.* °C.
2,4-Dichlorobenzoyl peroxide	54
Lauroyl peroxide	62
Caprylyl peroxide	63
Acetyl peroxide	69
Benzoyl peroxide	72
p-Chlorobenzoyl peroxide	75
t-Butyl peroxyisobutyrate	79
Hydroxyheptyl peroxide	85
Cyclohexanone peroxide	91
t-Butyl peracetate	102
Di-*t*-butyl diperphthalate	105
t-Butyl perbenzoate	105
Methyl ethyl ketone peroxide	105
Dicumyl peroxide	117
t-Butyl hydroperoxide-70	121
Di-*t*-butyl peroxide	126
p-Menthane hydroperoxide	133
Pinane hydroperoxide	141
2,5-Dimeth /lhexane-2,5 dihydroperoxide	154
Cumene hydroperoxide	158
t-Butyl hydroperoxide-90	172

(5). When the viscosity reaches about 32,000 centipoises or more, the meter is activated to ring a buzzer and to stop the timer, recording the gel time in minutes. In this work the results of these measurements, taken at several temperatures, were plotted as the log $(1000/t_G)$ vs. $1/T$ (where t_G = gel time in minutes and T = absolute temperature), a plot which is somewhat analogous to the Arrhenius plot used for the half-life data. Straight lines were not obtained, but the lower portions of the curves were relatively straight and could be extrapolated. By selecting a reasonable gel time value that passed through all the measured data, scales of activity were set up for each system, based on temperatures corresponding to the selected gel time. The peroxides used were commercial products of the same purity as previously indicated (3).

Measurements in a basic polyester resin: A known, basic polyester resin, having the composition and characteristics shown in Table III, right, was used in this study. All peroxide concentrations were calculated to give an active oxygen concentration equivalent to that of 1% benzoyl peroxide (11). This amounted to a peroxide group (-O-O-) concentration of approximately 0.05 mole per liter.

The plots of log $(1000/t_G)$ versus $1/T$ for the polymerization of this known polyester resin are shown in Fig. 2, above. These plots are relatively straight for the longer gel periods, but curve rather sharply for the shorter periods. The order of organic peroxide activity in the basic polyester, as determined from temperatures corresponding to a 15-min. gel time, is shown in Table IV, p. 140. Although there is a general correlation with the half-life order of activity, there are many irregularities in the over-all peroxide order.

Measurements in diallyl phthalate: Diallyl phthalate monomer (Shell Chemical), distilled under reduced nitrogen pressure, was polymerized with organic peroxide initiators in concentrations equivalent to 2% benzoyl peroxide. This amounts to about 0.10 mole of peroxide (*To page 140*)

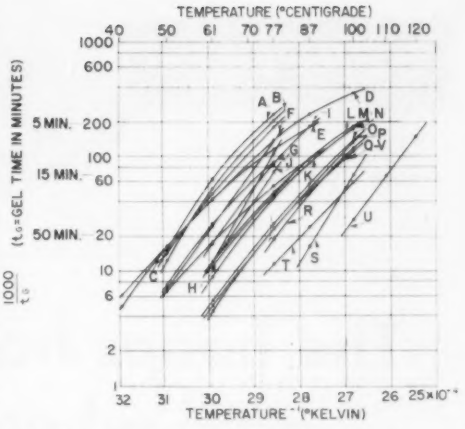


FIG. 2: Gel-time temperature curves. Gelation of a polyester resin by various organic peroxides. **A:** caprylul peroxide; **B:** lauroyl peroxide; **C:** 2,4-dichlorobenzoyl peroxide; **D:** methyl ethyl ketone peroxide; **E:** Luperox #6; **F:** acetyl peroxide; **G:** cyclohexanone peroxide; **H:** benzoyl peroxide; **I:** t-butyl peroxyisobutyrate; **J:** p-chlorobenzoyl peroxide; **K:** hydroxyheptyl peroxide; **L:** cumene hydroperoxide; **M:** pinane hydroperoxide; **N:** p-menthane hydroperoxide; **O:** t-butyl peracetate; **P:** t-butyl perbenzoate; **Q:** t-butyl hydroperoxide-70; **R:** di-t-butyl diperphthalate; **S:** Dicumyl peroxide; **T:** 2,5-dimethylhexane-2,5-dihydroperoxide; **U:** di-t-butyl peroxide; **V:** t-butyl hydroperoxide-90. Peroxide concentration approximately 0.05 moles peroxide group per liter. Peroxides identified as **Q** and **V** gave essentially identical curves.

Table III: Basic unsaturated polyester resin

Composition	
Maleic anhydride	1.0 mole
Phthalic anhydride	1.0 mole
Propylene glycol	2.2 moles
Acid No. of alkyd resin	45-50
Inhibitor added	0.013%

Diluted with monomeric styrene in the ratio of 3 parts styrene to 7 parts alkyd.

Physical properties	
Viscosity (Brookfield No. 2 at 20 r.p.m.)	13.08 poises
Specific gravity	1.14

Table II: Effect of di-*t*-butyl peroxide on the decomposition of two hydroperoxides in dilute benzene solutions

Peroxide	*Conc. moles/l.*	*Half-life at 145°C. hr.*
t-Butyl hydroperoxide	0.2	100.0
Cumene hydroperoxide	0.2	30.0
Di-*t*-butyl peroxide	0.2	1.2
Mixture #1		
Di-*t*-butyl peroxide	0.1	0.43
t-Butyl hydroperoxide	0.1	
Mixture #2		
Di-*t*-butyl peroxide	0.07	0.40
t-Butyl hydroperoxide	0.13	
Mixture #3		
Di-*t*-butyl peroxide	0.13	0.67
t-Butyl hydroperoxide	0.07	
Mixture #4		
Di-*t*-butyl peroxide	0.1	0.90
Cumene hydroperoxide	0.1	
Di-*t*-butyl peroxide in:		
Mixture #1	0.1	1.13
Mixture #2	0.07	1.17
Mixture #3	0.13	1.25
Mixture #4	0.10	1.30
t-Butyl hydroperoxide in:		
Mixture #1	0.10	0.14
Mixture #2	0.13	0.22
Mixture #3	0.07	0.10
Cumene hydroperoxide		
Mixture #4	0.10	0.50

HERCULES Plastics Hi-lites

The hoops have had it ... now what?

Tremendous markets for new polyolefin plastics seen on all fronts

A new plastic—*high-density polyethylene*—was responsible for the hula hoop, undoubtedly the biggest product success story of 1958. There's no similar market windfall in sight for the coming year, but most manufacturers see this same plastic, and a still newer member of the polyolefin family—*polypropylene*—as their best bets for building increased consumer sales in '59.

Housewares, appliances, sporting goods and toys are among the many fields where product planners are now finding ways to whet customer buying appetites with these new plastics. Polypropylene made its bow at the January housewares show in Pro-fax® cutlery handles and dinnerware (*see below*). At the same time Cory Corporation made the first use of Pro-fax in a commercial coffee service.

While the hoops got much of the publicity about high-density polyethylene last year, this material made its most significant long-term gain in another direction. Development of the first thin-wall, non-functional Hi-fax bottle opened up a giant new market for plastics in carrier-type bottles. First employed as a container for Breck Banish, the new Hi-fax bottles were quickly adopted by users of other drug and cosmetic products. Several producers now offer a line of stock Hi-fax bottles in a variety of shapes and sizes.

Meanwhile some of the nation's leading "Soapers" have been market-testing liquid detergents in Hi-fax bottles, with such excellent results to date that a switchover to this new type package may be imminent. The big advantage of Hi-fax in this use, in addition to its ease of fabrication, is its outstanding resistance to stress-cracking.

All three members of the Big Three are sporting either Hi-fax or Pro-fax parts on 1959 cars. The many other applications under evaluation point to an increased use of both these plastics with the model change due next fall.

President A. C. Martinelli of Rogers Plastics Corporation points to his new Lady Arnold dinnerware line for which he selected Hercules Pro-fax.

PUTTING THE WEAR IN PLASTICS DINNERWARE . . . Pro-fax does it in the new Lady Arnold line to the extent that its manufacturer, Rogers Plastics, guarantees these dishes for life against chipping, cracking, and staining. Combining the beauty and elegance of expensive china with the low-cost durability of a tough thermoplastic, this new dinnerware is completely dishwasher proof, and molded in four lustrous pastel colors with a rich permanent gloss.

Hot tip for coffeemakers

A new pouring lip for Cory serving decanters, molded with Pro-fax, polypropylene plastic, looks better, lasts longer and costs less than conventional metal spouts. Cory Super-Tuf* pouring lips will take all kinds of abuse . . . won't dent, crack or stain from hot beverages or harsh detergents. Molded with black Pro-fax, they have a rich, glossy finish that is unharmed by high temperatures or hard use.

BETTER IDEAS FOR BETTER COFFEE ALWAYS COME FROM CORY . . . that's the company's motto and to prove its point Cory uses Pro-fax for a new type pouring spout unharmed by detergents and defying abuse.

Designed to combine with Cory's Majestic* glass serving decanter for the utmost in a modern, smartly styled coffee service, the new spouts can also be employed as replacement parts with current model Cory handles and neckbands.

**Registered trademark of Cory Corporation, Chicago, Ill.*

No trouble with Pro-fax

The manufacturer of this durable and attractive trouble lamp tried other plastics in the handle, but only Pro-fax proved up to the job. Equipped with U.L. approved cords, ranging in length from 20 to 50 feet in red, green, or black, with matching Pro-fax handles, this new trouble light features a push-button switch, convenience outlet, and cord strain relief, is oil, grease, acid, and alkali resistant. Pro-fax handles are molded by Precision Plastics Company, Philadelphia, Pa., for M. Black Manufacturing of the same city.

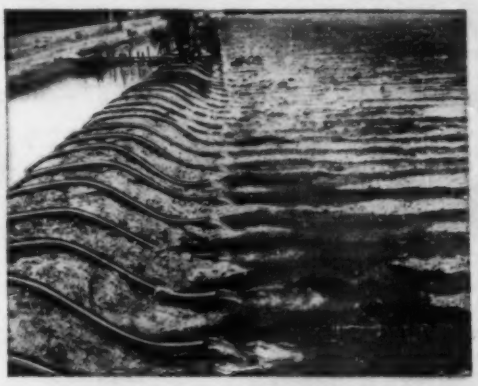
Market Hi-lites

A new cup produced by Crown Plastics Cup Company, Fort Worth, Texas, demonstrates the excellent moldability of Pro-fax in thin-wall sections. With a six-ounce capacity, the cups weigh less than a third of an ounce each, yet are unbreakable and can be sterilized. Among their first uses was in hospitals where with re-use after sterilization they have proved actually cheaper than the paper disposables formerly employed . . . Another new Pro-fax hospital item is a plastic bedside carafe and tumbler set manufactured by Zylon Products Company, Pawtucket, R. I. Completely autoclavable and fitted with a disposable plastic-film liner, this well-designed new product promises to revolutionize the entire technique of bedside water service. The first use of Pro-fax in an aerosol type package will be announced by one of the nation's leading cosmetic manufacturers within the next few weeks.

A 7½-inch Pro-fax rope has just replaced a 10-inch manila hawser on the Sinclair supertanker, S.S. J. E. Dyer. A product of American Manufacturing Company, the new plastic rope actually has greater breaking strength than its larger manila counterpart.

Good dam use for Hi-fax

Literally miles of Hi-fax tubing are being used here to siphon water over the high banks of a dammed-up ditch,



in the pre-irrigation of a cotton field. Hi-fax siphon tubes are becoming standard equipment throughout the irrigated West and South, eliminating the labor involved in cutting through ditch banks, providing better control of flow and reducing soil erosion. The Swanson Company of Phoenix, Arizona, first to produce the new Hi-fax tubes, promotes them as "tougher, lighter, with greater resistance to high and low temperatures and higher tensile strength." They are now marketed in lengths from 48" to 90" in both 1" and 2" Hi-fax tubing extruded by Arizona Plastics Extrusion Company, Phoenix, Arizona.

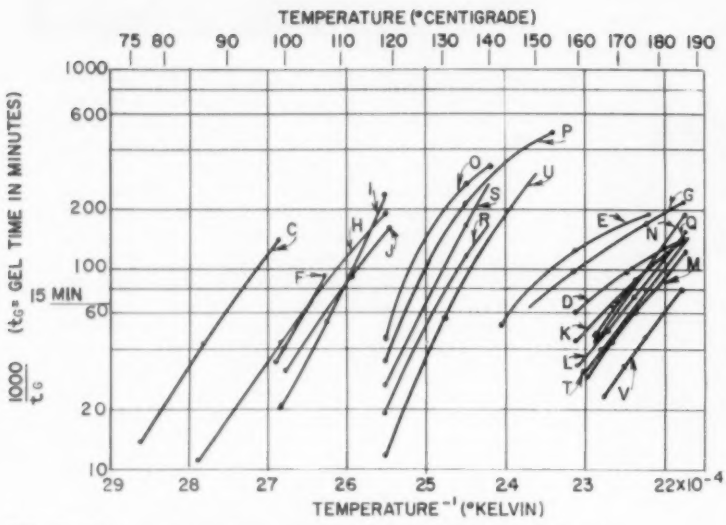


FIG. 3: Gel-time temperature curves. Gelatin of diallyl phthalate by various organic peroxides. **A** and **B** did not gel diallyl phthalate. Peroxide concentration approximately 0.10 moles peroxide group per liter. **C:** 2,4-dichlorobenzoyl peroxide; **D:** methyl ethyl ketone peroxide; **E:** Luperox # 6; **F:** acetal peroxide; **G:** cyclohexanone peroxide; **H:** benzoyl peroxide; **I:** t-butyl peroxyisobutyrate; **J:** p-chlorobenzoyl peroxide; **K:** hydroxyheptyl peroxide; **L:** cumene hydroperoxide; **M:** pinane hydroperoxide; **N:** p-menthane hydroperoxide; **O:** t-butyl peracetate; **P:** t-butyl perbenzoate; **Q:** t-butyl hydroperoxide-70; **R:** di-t-butyl diperphthalate; **S:** dicumyl peroxide; **T:** 2,5-dimethylhexane-2,5-dihydroperoxide; **U:** di-t-butyl peroxide; **V:** t-butyl hydroperoxide-90.

group (-O-O-) per liter of solution, twice that used for the polyester polymerization. The higher concentration was used in order to get gelation times equivalent to those obtained in the polyester resin while still working in approximately the same temperature range. The plots of log $(1000/t_G)$ versus 1/T gave similar type curves (Fig. 3, left) to those obtained in the polyester work, with considerable curving in the shorter gel time ends. The order of peroxide activity in diallyl phthalate, which is based on the temperatures corresponding to the 15-min. gel time, is shown in Table V, below.

Again the order of activity shows a general agreement with half-life results with some rather surprising variations. Curves for caprylyl peroxide and lauroyl peroxide are absent because these two peroxides could not be made to polymerize the diallyl phthalate sufficiently to reach the gelation state. It appeared that the radicals were formed too rapidly and, therefore, underwent side reactions rather than *(To page 144)*

Table IV: Order of peroxide activity in an unsaturated polyester resin based on temperatures corresponding to a selected gel time (t_G)[a]

Peroxide	*Temp. for t_G = 15 min.*
	°C.
Caprylyl peroxide	61
Lauroyl peroxide	64
2,4-Dichlorobenzoyl peroxide	65
Methyl ethyl ketone peroxide	66
Luperox #6	68
Acetyl peroxide	70
Cyclohexanone peroxide	72
Benzoyl peroxide	74
t-Butyl peroxyisobutyrate	74
p Chlorobenzoyl peroxide	76
Hydroxyheptyl peroxide	81
Cumene hydroperoxide	81
Pinane hydroperoxide	82
p-Menthane hydroperoxide	83
t-Butyl peracetate	88
t-Butyl perbenzoate	88
t-Butyl hydroperoxide (70 or 90)	91
Di-*t*-Butyl diperphthalate	92
Dicumyl peroxide	99
2,5 Dimethylhexane-2,5-dihydroperoxide	102
Di-*t*-butyl peroxide	109

[a]Peroxide concentrations equivalent in active oxygen to 1% benzoyl peroxide, i.e., approximately 0.05 mole of peroxide group per liter.

Table V: Order of peroxide activity in diallyl phthalate based on temperature corresponding to a selected gel time (t_G)[a]

Peroxide	*Temp. for t_G = 15 min*
	°C.
2,4-Dichlorobenzoyl peroxide	91
Benzoyl peroxide	104
Acetyl peroxide	105
p-Chlorobenzoyl peroxide	109
t-Butyl peroxyisobutyrate	109
t-Butyl peracetate	121
t-Butyl perbenzoate	123
Dicumyl peroxide	126
Di-*t*-butyl diperphthalate	130
Di-*t*-butyl peroxide	133
Luperox #6	147
Cyclohexanone peroxide	149
Methyl ethyl ketone peroxide	163
Hydroxyheptyl peroxide	168
t-Butyl hydroperoxide-70	169
p-Menthane hydroperoxide	171
Cumene hydroperoxide	172
2,5-Dimethylhexane-2,5-dihydroperoxide	174
Pinane hydroperoxide	176
t-Butyl hydroperoxide-90	183

[a]Peroxide concentrations equivalent in active oxygen to 2% of benzoyl peroxide, i.e., approximately 0.10 mole of peroxide group per liter.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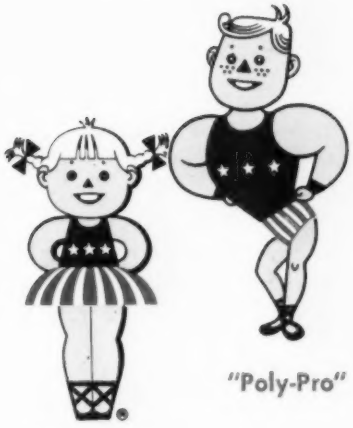

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Polyethylene, Low Pressure	.941 - .965	155 - 175	R30 - R50	3500 - 5500
Nylon	1.09 - 1.14	260 - 360	R103 - R118	7000 - 12000
Polystyrene, General Purpose	1.04 - 1.06	160 - 210	M65 - M90	5000 - 9000
Cellulose Acetate Butyrate	1.15 - 1.22	130 - 227	R30 - R115	2600 - 6900
ABS Copolymer	1.01 - 1.10	206 - 220	R60 - R110	2500 - 7000

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initiating polymerization of the relatively unreactive diallyl phthalate.

Order of peroxide activity

When all the data obtained in the three systems—benzene, polyester resin, and diallyl phthalate—are evaluated, it is seen that the best correlation of peroxide activity lies within peroxide structural groups. It is noted that the peroxides that would be less likely to be affected by the system are those that gave the closest correlation, while those that would be expected to be readily subject to activators or to induced decomposition gave the poorest correlation throughout the three systems. The peroxides are listed in Table VI, below, in order of activity within each structural group, for each of the three systems studied. The correlation between results of peroxide activity in benzene half-life, polyester resin, and diallyl phthalate is extremely good in structural groups such as dialkyl peroxides, *t*-butyl peroxyesters,[2] and aryl diacyl peroxides. Correlation is also good for the aliphatic diacyl group between half-life and polyester resin data, although in the diallyl phthalate, caprylyl peroxide and lauroyl peroxide failed to cause gelation. In the ketone peroxides it is difficult to determine whether there is any real correlation between the systems. The fact that ketone peroxides, as available commercially, are open chain compounds probably containing hydroxyl or hydroperoxy groups and subject, in some cases, to dissociation in solution (13), could readily account for these wide variations. In the polyester resin, which contains hydroquinone, a compound that has been found to accelerate hydroperoxide decomposition (8), the ketone peroxides are very active. In diallyl phthalate they apparently lead to some peroxidic compounds which are relatively stable and which will cause gelation at high temperatures but at lower temperatures do not cause sufficient growing radical formation.

The alkyl hydroperoxides are active at moderate temperatures in the polyester resin but show essentially high temperature activity in the diallyl phthalate. This latter result corresponds to the half-life results which indicate the hydroperoxides to be the highest temperature initiators. There is no essential *(To page 172)*

[2] It has been reported recently that *t*-butyl peracetate has a longer half-life than *t*-butyl perbenzoate at 60° C. in chlorobenzene solution (12), a result which is opposite from that expected from our studies.

Table VI: Order of decreased organic peroxide activity within structural groups

From 10-hr. half-life temperatures in benzene	*From 15-min. gel time temperatures in a known polyester resin*	*From 15-min. gel time temperatures in a cross-linking monomer, diallyl phthalate*
	Aliphatic diacyl peroxides	
Lauroyl peroxide	Caprylyl peroxide	—
Caprylyl peroxide	Lauroyl peroxide	—
Acetyl peroxide	Acetyl peroxide	Acetyl peroxide
	Aromatic diacyl peroxides	
2,4-Dichlorobenzoyl peroxide	2,4-Dichlorobenzoyl peroxide	2,4-Dichlorobenzoyl peroxide
Benzoyl peroxide	Benzoyl peroxide	Benzoyl peroxide
p-Chlorobenzoyl peroxide	*p*-Chlorobenzoyl peroxide	*p*-Chlorobenzoyl peroxide
	t-Butyl peroxyesters	
t-Butyl peroxyisobutyrate	*t*-Butyl peroxyisobutyrate	*t*-Butyl peroxyisobutyrate
t-Butyl peracetate	*t*-Butyl peracetate	*t*-Butyl peracetate
Di-*t*-butyl diperoxyphthalate	*t*-Butyl perbenzoate	*t*-Butyl perbenzoate
t-Butyl perbenzoate	Di-*t*-butyl diperphthalate	Di-*t*-butyl diperphthalate
	Ketone and aldehyde peroxides	
Hydroxyheptyl peroxide	Methyl ethyl ketone peroxide	Luperox #6[a]
Cyclohexanone peroxide	Luperox #6[a]	Cyclohexanone peroxide
Methyl ethyl ketone peroxide	Cyclohexanone peroxide	Methyl ethyl ketone peroxide
	Hydroxyheptyl peroxide	Hydroxyheptyl peroxide
	Hydroperoxides	
t-Butyl hydroperoxide-70	Cumene hydroperoxide	*t*-Butyl hydroperoxide-70
p-Menthane hydroperoxide	Pinane hydroperoxide	*p*-Menthane hydroperoxide
Pinane hydroperoxide	*p*-Menthane hydroperoxide	Cumene hydroperoxide
2,5-Dimethylhexane-2,5-dihydroperoxide	*t*-Butyl hydroperoxide (70 or 90)	2,5-Dimethylhexane-2,5-dihydroperoxide
Cumene hydroperoxide	2,5-Dimethylhexane-2,5-dihydroperoxide	Pinane hydroperoxide
t-Butyl hydroperoxide-90		*t*-Butyl hydroperoxide-90
	Dialkyl peroxides	
Dicumyl peroxide	Dicumyl peroxide	Dicumyl peroxide
Di-*t*-butyl peroxide	Di-*t*-butyl peroxide	Di-*t*-butyl peroxide

[a] A solid ketone peroxide offered by Lucidol Division, Wallace & Tiernan, Inc.

Polyethylene environmental stress-cracking by the bent strip test method

By K. A. Kaufmann*

The bent strip test method for environmental stress cracking of ethylene plastics has been under study since November, 1954, by Subcommittee XV, Thermoplastic Materials, of A.S.T.M. Committee D-20 on Plastics. The Task Group of Section J of that Subcommittee has not yet been able to control all the variables of the method to secure adequate between-laboratory reproducibility of results, although within-laboratory accuracy is fair. A previous report (1, 2)[1] indicated the status of this work as of the fall of 1956.

The Task Group's original assignment was to develop this proposed method of test for use as an identification of ethylene polymers in a major revision of the A.S.T.M. D 1248 Specification for Polyethylene Molding and Extrusion Materials. The Task Group adopted the following resolution in November, 1957, relative to the results of its work: "The Task Group does not yet have an environmental stress cracking test procedure capable of giving precise, universally reproducible F_{50} values. Major causes of this appear to be the problems of reproducibly preparing test sheets, standardizing the geometry of the test specimen under stress, and accounting for creep relaxation of the specimen. The bent strip procedure as published for information in the appendix of the February, 1957, D-20 Book of Standards may be useful for routine inspection and acceptance tests. The Task Group recommends that only this form of the procedure be considered for inclusion in the pending revision of the polyethylene materials specification D 1248 and that consideration of F_{50} times be deferred until a satisfactory solution to the problem is found."

The proposed method, however, is not presently included in the revised polyethylene specification D 1248-58T because it is a mere proposal, and at present lacks even tentative method status. The particular procedure published for information only in the appendix of the 1958 D-20 Book of Standards is an improved version over that previously published by the group (1, 2). The objective in prior versions was a reliable F_{50} time determination for comparison purposes. Failing to meet this objective, it has been necessary to curtail the suggested use to routine inspection and acceptance testing. This means that individual laboratories must establish the level of acceptability with full realization that other laboratories may not be able to obtain

Table I: Tabulations of the results of the first round robin on

			F_{50} time, hr.						
Participating laboratory	*Sample→ Melt index→ Treatments→*	*A-1 0.214 Mill.*	*A-2 0.792 Mill.*	*A-3 1.28 Mill.*	*A-3 1.28 Gr.*	*B-1 2.01 Mill.*	*C-1 0.25 Mill.*	*C-2 0.44 Mill.*	*C-3 1.86 Mill.*
Union Carbide Plastics Co.	(1)	>336	4.8	0.36	0.63	>336			
	(2)	>336	5.7	0.50	0.80	>336			
	Avg.	>336	5.3	0.4	0.7	>336			
Spencer	(1)	>336	2.0	1.40	0.67	12			
	(2)	>336	3.2	0.52	0.83	50			
	Avg.	>336	2.6	1.0	0.8	31			
Du Pont	(1)			0.32	0.62		>366	>366	6.3
	(2)			0.35	0.45		>366	>366	6.7
	Avg.			0.3	0.5		>336	>336	6.5
Koppers	(1)			1.00	0.72		>366	>366	64
	(2)			1.25	0.72		>366	>366	105
	Avg.			1.1	0.7		>336	>336	85
Phillips	(1)			0.2	0.4		>366	>366	130
	(2)			0.2	0.2		>366	>366	125
	Avg.			0.2	0.3		>336	>336	128
C. I. L.	(1)			0.6	0.7				
	(2)			0.7	0.7				
	Avg.			0.7	0.7				
Monsanto	(1)			0.22	0.25				
	(2)			0.22	0.21				
	Avg.			0.2	0.2				
Tenn. Eastman	(1)			0.26	0.24				
	(2)			0.12	0.28				
	Avg.			0.2	0.3				
Bell Tel. Lab.	(1)			0.40	0.35				
	(2)			0.33	0.27				
	Avg.			0.4	0.3				
Continental	(1)			0.71	0.35				
	(2)			0.45	0.35				
	Avg.			0.6	0.4				
Average of All Labs.		>336	4.0	0.5	0.5	?	>336	>336	73.2

[a] "Mill." means that the granules were milled prior to compression molding the specimens.

* Chairman, Task Group I, Section J., Subcommittee XV, A.S.T.M. Committee D-20 on Plastics.

[1] Numbers in parentheses link to references at end of article, p. 174.

similar results with the lot of material.

Cooperative round robin test programs are not now underway, but various participating laboratories are individually studying some of the basic problems of this method and other means of testing for the phenomenon. Further cooperative work may be undertaken at such time as an adequate break-through occurs.

History of test work

In this report we would like to summarize the techniques used and results obtained in the four round robin test programs which led to the conclusion of the Task Group regarding the usefulness of the proposed method.

This proposed method of test was originally developed by the Bell Telephone Laboratories (3, 4) and their procedure was utilized in the first round robin. The only basic difference between that method and the one published in the 1957 D-20 Book of Standards was the use of a test tube alone to hold the samples instead of the channel jig now specified. Data obtained in the first round robin are shown in Table I, below.

The second round robin utilized the channel specimen holders and investigated the effects of dilute reagent, sample preparation variables, and bending jigs. The data are presented in Table II, p. 148. It was concluded that dilute reagent was not useful for classifying the resins studied under the specific test conditions used. Samples prepared at one location gave more among-laboratory agreement than those prepared at the testing site, and it was thus concluded that sample preparation was one of the important uncontrolled variables. From results of two laboratories testing both with and without mechanical bending jigs to control this variable, it was concluded that this too was an important variable. In an attempt to determine the effect of sample molding conditions upon test results, a study of the conditions used by each participating laboratory to produce the samples for the second round robin was made. No correlation was found.

The data in Tables I and II show that a very definite lack of reproducibility between laboratories existed, but that, by and large, duplicate runs within a given laboratory gave fair reproducibility. All materials tested were normal density polyethylenes with the exception of R-1 which was a higher density (0.96) polymer. Present A.S.T.M. density

				F_{50} time, hr.												
C-4	D-1	D-2	E-1	E-2		E-3	E-4	K-1	K-2	K-3		K-4	K-5	R-1		
1.2	1.1	3.5	2.	2.	2.	2.	7.	0.3	0.8	1.8	1.8	2.9	7.0	0.47	0.47	0.47
Mill.	Mill.	Mill.	Mill.	Mill.	Gr.	Mill.	Mill.	Mill.	Mill.	Mill.	Gr.	Mill.	Mill.	Mill.	Gr.	Mill.[b]
				29.5	37.5					88	155			9.8	11.3	8.6
				54.0	57.5					178	190			10.7	9.7	9.8
				41.8	47.5					133	172			10.3	10.5	9.2
				0.79	5.0					12.5	63			12.5	20	8.8
				1.20	5.0					66.0	141			20	13	8.8
				2.0	2.5					39.3	102			16.3	16.5	8.8
1.4				2.0	1.9					6.5	7.9			24	34	12.5
1.7				1.9	1.3					5.7	5.8			29	31	9.7
1.6				2.0	1.6					6.1	6.9			27	33	11.1
8				13.5	3.4					>336	16.5			24.0	11.8	15.2
14				13.0	3.4					>336	16.5			15.2	11.8	15.2
11				13.3	3.4					>336	16.5			19.6	11.8	15.2
2.7				0.6	1.4					16	68			30	15	12
2.1				0.6	2.5					18	69			16	17	11
2.4		2.1		0.6	2.0					17	68.5			23.	16.	11.5
	>366	12.0	0.7	5	15	1.6	0.2			8	16					16
	>366	1.0	0.7	14	4	2.4	0.1			8	25					17
	>336	5.3	0.7	9.5	9.5	2.0	0.2			8	20.5					16.5
	>336	0.40	0.20	12.5	34.0	>336	0.25			>336	>336			9.6	9.6	7.2
	>336	0.30	0.20	11.5	59.0	>336	0.30			>336	>336			9.6	9.6	8.9
	>336	0.4	0.2	12.0	46.5	>336	0.3			>336	>336			9.6	9.6	10.5
	>336	8.		0.9				>336	>336	2.4	2.	1.2	0.37	9.8	9.8	9.8
	>336	9.		0.9				>336	>336	4.0	4.	0.8	0.12	9.8	9.8	9.8
	>336	8.5		0.9				>336	>336	3.2	3.0	1.0	0.3	9.8	9.8	9.8
				0.52	0.35			>120	>120	10.0	8.2	1.5	0.18	10.8	10.8	10.8
				0.15	0.31			>120	>120	2.6	18.0	1.1	0.20	14.5	10.8	14.5
				0.3	0.3			>120	>120	6.3	13.1	1.3	0.2	11.7	10.8	11.7
				0.38	1.7			>336	>336	3.0	2.9	1.0	0.20	10.1	12.1	10.1
				1.9	1.9			>336	>336	4.0	4.5	1.5	0.12	10.4	12.1	10.0
				1.1	1.8			>336	>336	3.5	3.7	1.3	0.2	10.3	12.1	10.1
5.0	>336	4.3	0.5	8.4	12.8	?	0.3	?	?	?	?	1.2	0.2	15.3	14.5	11.3

"Gr." means that the specimens were compression molded directly from the granules. [b]Specimens were 0.075 in. thick (instead of 0.125 in.).

nomenclature for polyethylene is as follows: Type I, 0.910 to 0.925; Type II, 0.926 to 0.940; Type III, 0.941 to 0.965.

Third round robin

The basic procedure for the proposed method was revised in August, 1956, for a third round robin. This revision provided for closer control of the molding cycle, specified a window or chase mold, flash type, with thin plates instead of the standard A.S.T.M. compression mold, and ruled out the use of chemical release agents during molding (because many of these are effective stress crack agents). These changes were based on evidence of their need.

The August, 1956, procedure, which was published in references (1) and (2), was called Procedure A and the following variations from it were also studied in the third round robin:

Procedure B—Fast cooling during sheet molding (2 min. instead of 8 min.).

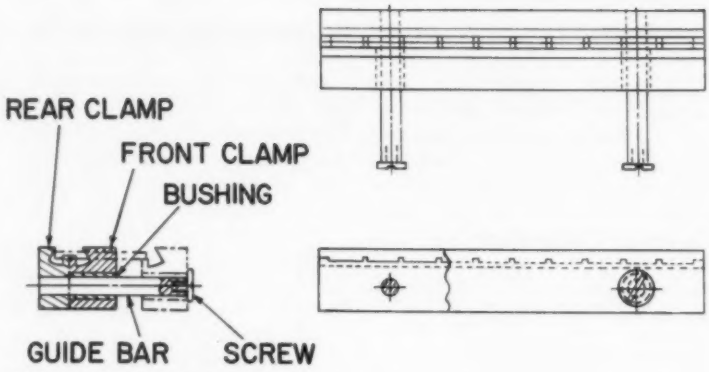

FIG. 1: Bending clamp assembly.

Procedure C—Use of 0.075 in. thick specimens (instead of 0.125 in.).

Procedure D—Use of 20% reagent solution by weight in water instead of concentrated; and test at 23° C. instead of 50° C.

Procedure E—Use of the Bell Telephone Laboratories' bending and transfer jigs (see Figs. 1, above, and 2, p. 151.

The three materials used were selected from among those used in the previous programs. The data are shown in Table III, p. 150. It was concluded that agreement between laboratories was still less than satisfactory in all procedures, although each variation of the basic procedure seemed to improve the situation. These improvements did not, however, always rank the resins in the same order (*To page 151*)

Table II: Second round robin on stress-cracking of ethylene plastics[a]

	F50 time for resin B-1 (M.I. 2.0), hr.						*F50 time for resin K-3 (M.I. 1.8), hr.*						*F50 time for resin C-2 (M.I. 0.44), hr.*					
	CO-630 as rec'd			*CO-630, 66⅔% H_2O*			*CO-630 as rec'd*			*CO-630, 66⅔% H_2O*			*CO-630 as rec'd*			*CO-630, 66⅔% H_2O*		
Laboratory	*1*	*2*	*Avg.*	*1*	*2*	*Avg.*	*1*	*2*	*Avg.*	*1*	*2*	*Avg.*	*1*	*2*	*Avg.*	*1*	*2*	*Avg.*
Specimens from sheets pressed by individual testing laboratory																		
Union Carbide Plastics	100	200	150	9.8	9.8	9.8	137	185	161	9.8	17.0	13.4	>336	>336	>336	15.5	19.2	17.4
Phillips[b]	>336	>336	>336	8.01	7.5	7.8	>336	>336	>336	7.0	7.0	7.0	>336	>336	>336	5.6	5.6	5.6
C.I.L.	12.0	4.0	8.0	5.6	5.6	5.6	3.0	3.3	3.2	5.6	5.6	5.6	>336	>336	>336	5.6	5.6	5.6
Dow	24	27	26	2.8	3.0	2.9	26	17	22	1.9	2.5	2.2	>336	>336	>336	2.2	1.8	2.0
Cont. Can	5.8	2.28	4.04	2.45	1.49	1.97	9.85	10.8	10.3	1.89	2.83	2.4	>336	>336	>336	2.84	2.84	2.8
Koppers	10	10	10	10	10	10	10	10	10	10	16	13	>336	>336	>336	10	10	10
Average			?			6.3			?			7.3			>336			7.2
Randomized specimens from sheets pressed by resin producer																		
Spencer (a)[c]	4.0	2.5	3.3	9.8	9.8	9.8	105	21	63	9.8	9.8	9.8	>336	>336	>336	9.8	9.8	9.8
(b)	3.8	2.5	3.2	6.8	6.2	6.5	115	7	61	4.5	4.5	4.5	>336	>336	>336	4.5	4.7	4.6
I.C.I.[d]	8.2	6.5	7.4	5	6	5.5	48	96	72	3.5	3.0	3.3	>336	>336	>336	3.0	3.0	3.0
Monsanto (a)	2.0	24	13	3.6	3.6	3.6	12	44	28	3.0	2.6	2.8	>336	>336	>336	3.6	2.6	3.1
(b)[e]	>336	>336	>336	>336	>336	>336	>336	>336	>336	210	83	147	>336	>336	>336	>336	>336	>336
(c)[f]	4.3	5.3	4.8	6.1	4.9	5.5	16	26	21	4.4	4.2	4.3	>336	>336	>336	6.1	5.7	5.9
Bell Tel. Lab. (a)	8.3	6.0	7.2	3.1	2.8	3.0	78	25	52	2.5	2.9	2.7	290	>336	>290	1.2	1.0	1.1
(b)[g]	2.8	3.0	2.9	2.8	3.2	3.0	8.5	9.5	9.0	2.8	2.8	2.8	>336	>336	>336	1.4	1.2	1.3
Du Pont	10	16	13	5.0	5.0	5.0	37	120	79	2.7	2.8	2.8	>336	>336	>336	3.1	3.1	3.1
Tenn. East.[h]	13	24	18.5	2.95	2.95	2.95	122	34	78	2.8	2.8	2.8	235	>300	>235	2.8	2.95	2.88
Average[i]			10.4			5.0			62			4.0			>235			3.8

[a] Tests were made in accordance with the Jan. 16, 1956, draft of the proposed method of test for the stress cracking of ethylene plastics except where indicated.

[b] Observations were made at two additional periods of 8 and 16 hr.

[c] Reagent preheated at 50° C. was unintentionally used. The (b) values were plotted from data taken at shorter time intervals.

[d] The following values were obtained by I.C.I. with their standard reagent Lissapol **N**: B-1 Resin — 3.25 hr., K-3 Resin — 2.25 hr., and C-2 Resin — 3.0 hr.

[e] Monsanto bending jig used instead of jig specified in draft of Jan. 16, 1956, (see reference 2).

[f] Specimens annealed 1 hr. at 100° C. instead of ½ hr. in boiling water.

[g] Bell Telephone Laboratories bending jig used.

[h] Test specimens were inserted in the channels by pushing the bent specimens through holes cut in the bottom.

[i] Test results (b) and (c) are not included.

Table III: Third round robin on stress-cracking of ethylene plastics

Procedure[a]	A			B			C			D			E		
Run number→	1	2	Avg.	1	2	Avg.	1	2	Avg.	1	2	Avg.	1	2	Avg.
Laboratory	F_{50} time for resin A-3, hr.														
Dow	0.7	0.7	0.7	0.5	0.6	0.5	13.8	51.5	32.6						
Tenn. Eastman				1.2	1.0	1.1	4	2	3	18	48	33			
Du Pont							1.9	2.1	2.0	55	52	54	>336	>336	>336
Bell Tel. Lab.	4.6	4.0	4.3	6.4	5.4	5.8	10.8	8.0	9.6						
Koppers	—	—	1.2	—	—	1.7	—	—	3.8	—	—	44			
C.I.L.	1.4	1.0	1.2				12	12	12	21.5	25	23	2.1	1.8	1.95
Phillips	.49	.98	.74	1.75	1.95	1.85							1.6	1.2	1.4
Spencer	1.4	0.7	1.05							19.0	13.0	16.0	2.7	2.0	2.35
I.C.I.	3.1	4.0	3.55							43	24	33.5	1.1	1.0	1.05
Monsanto	.97	.67	.82	1.2	2.1	1.65							.87	.92	.89
Nat. Petrochem	3.3	4.1	4.2	4.2	3.5	3.9							3.0	3.6	3.3
Union Carbide Plastics	—	—	1.0	—	—	1.5							—	—	1.0
	F_{50} time for resin K-3, hr.														
Dow	13	10	11	2.2	5.3	3.8	>216	>216	>216						
Tenn. Eastman				144	156	150	>312	>312	>312	96	43	69.5			
Du Pont							>336	>336	>336	210	200	205	102	144	123
Bell Tel. Lab.	14.0	12.0	13.0	9.0	5.8	7.4	>336	>336	>336						
Koppers	—	—	3.4	—	—	3.1	—	—	336	—	—	154			
C.I.L.	23	165	20				>360	>360	>360	122	110	116	11	73	42
Phillips	110	>336		190	98	144							>336	>336	>336
Spencer	35	80	57.5							72	100	86	34	34	34
I.C.I.	>336	>336	>336							>336	>336	>336	81	96	88.5
Monsanto	110	91	100	145	175	160							>336	>336	>336
Nat. Petrochem	25	75	50	25	40	32.5				336	336	336	30	33	31.5
Union Carbide Plastics	—	—	9.75	—	—	5.0				—	—	3.5	—	—	24.0
	F_{50} time for resin R-1, hr.														
Dow	15	27	21	14	14	14	13	11	12						
Tenn. Eastman				27	32.5	29.8	14	14	14	>312	>312	>312			
Du Pont							52	50	51	>336	>336	>336	39	37	38
Bell Tel. Lab.	39	32	35.5	17.4	24.6	20.9	13.4	15.8	14.6						
Koppers	—	—	46	—	—	28	—	—	48	—	—	336			
C.I.L.	19.5	18	19				13.7	13.7	13.7	295	359	327	15	19	17
Phillips	18.5	17.5	18.0	21	19.5	20.3							21	19.5	20.3
Spencer	27	20	23.5							360	500	430	21	19	20
I.C.I.	36.0	41.5	38.7							>336	>336	>336	17.5	16.0	16.75
Monsanto	36	37	36.5	29.5	22	25.7							34	34	34
Nat. Petrochem	23	28	25.5										32	32	32
Union Carbide Plastics	—	—	30.75										—	—	31.5

[a]Procedure modifications: A. August 1956 revised method. B. Fast cooling (2 min.) during sheet molding. C. 0.075 in. thick specimens. D. 20% reagent solution in water and test at 23° C. E. Use of Bell Telephone Laboratories bending and transfer jigs.

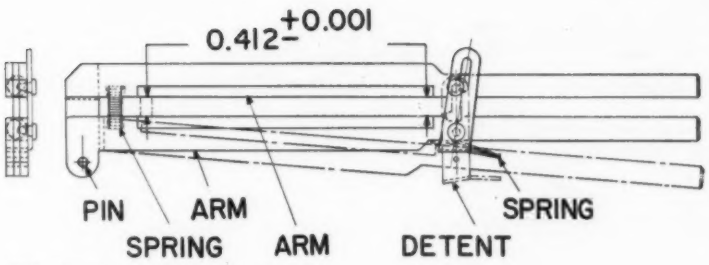

FIG. 2: Transfer tool assembly.

of acceptability, but procedures C and D appeared best of the variations tried. Extra work done by some laboratories indicated some advisability of combining some of the variations into a single test and a strong necessity for use of higher annealing temperatures with increasing sample density.

Fourth round robin

Accordingly, it was decided that a fourth round robin should be conducted using a method based upon Procedure A from the third round robin as modified by Procedures C, D, and E (0.075 in. specimens, 20% reagent, and Bell Telephone Laboratories' bending and transfer jigs). Although the use of these jigs indicated no greater improvement than the use of fast cooling in Procedure B, they were preferred because of the mechanical ease of manipulation which they provided to the test and because the fast cooling (2 min.) might not be universally attainable because of equipment limitations. In addition, temperatures adopted were as follows:

Type	*Density, d^{23}*	*Temp., °C.*
I	0.910—0.925	100 ± 1.0
II	0.926—0.940	110 ± 1.0
III	0.941—0.965	120 ± 1.0

In this fourth round robin, two of the lower density resins and the one higher density material from the previous round robins were used, plus a medium density (0.935) resin made by the high pressure process. Three methods of annealing were employed: air oven annealing followed by quick cooling at room temperature, as the basic procedure; air oven annealing followed by slow cooling in the oven to room temperature; and autoclave annealing followed by quick cooling at room temperature. Annealing time was 1 hr. in all cases.

The data of the fourth round robin are shown in Table IV, below. It is readily apparent that inter-laboratory agreement was not attained. At this point the Task Group decided not to conduct further cooperative programs until more definite ideas could be developed to improve the situation. In addition to work being done on the bent strip test by a number of laboratories individually, a few are investigating other means of measuring this property.

Industry status

The proposed method is being widely used in industry as a go-no-go gage for product comparisons and inspection acceptance practices. Specifically, its use in this area has been to allow not more than 20% failure of specimens in 48 hr. for Type I polyethylene materials. Such a criterion has been used by the Bell Telephone Laboratories' bending 10 yr. in their specifications for Type I polyethylenes of low melt index (<0.5 g./10 min.) for capable sheathing. Essentially the method used is the procedure of August, 1956, plus use of the Bell Telephone Laboratories' bending and transfer jigs as a mechanical aid. This is the procedure published in the 1958 D-20 Book of Standards. Paragraph 8(b) under "Procedure" of (*To page 174*)

Table IV: Fourth round robin on stress-cracking of plastics

	F_{50} time, hr.											
	Resin A-3			*Resin K-3*			*Resin R-1*			*Resin X-1*		
Laboratory	*1*	*2*	*Avg.*	*1*	*2*	*Avg.*	*1*	*2*	*Avg.*	*1*	*2*	*Avg.*
						Standard procedure						
Spencer	3.0	2.8	2.9	9.4	6.9	8.2	165	160	162.5	3.8	4.0	3.9
Phillips	220	220	220	336	336	336	290	300	295	310	321	316
I.C.I.	3.0	2.7	2.9	30	29	29.5		See note[a]		0	0	0
Dow[b]	200	>336		>336	>336	>336	>336	>336	>336	>336	>336	>336
Bell Tel. Lab.	25	25	25	47	51	49	178	190	184	0.85	0.85	0.85
Du Pont	21.5	27	24	31	30	30.5	200	200	200	24	30.5	37
						Slow cooling						
Spencer	0.9	1.1	1.0	1.55	1.65	1.6	224	198	211	0	0	
Phillips	52	54	53	127	125	126	336	336	336	76	78	77
I.C.I.	1.0	0.9	0.95	2.15	2.05	2.1	—	—	—	—	—	—
Tenn. Eastman	8.2	4.6	6.4	83	76	79.5	>312	>312	>312	2	2	2
						Autoclave annealing						
Spencer	2.3	2.3	2.3	10.8	9.9	10.4	194	184	189	0	0	0
Phillips	130	137	133.5	336	336	336	320	325	322.5	336	336	336

[a]Cold drawing occurred on bending. Normal failures did not occur. Failures at outer edge after 170 hr.: *Standard Procedure*/ 1-60%, 2-10%; *Slow Cooling*/ 1-100%; 2-20%. [b]Did not use bending jig.

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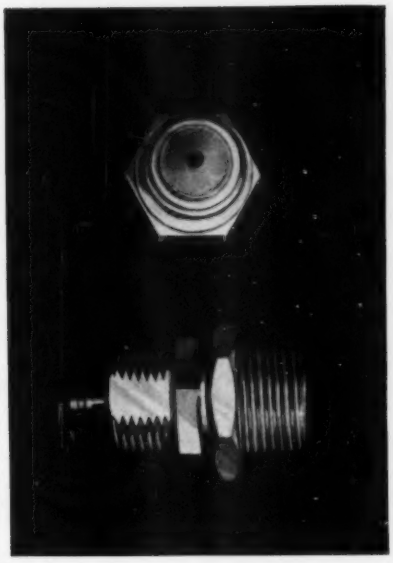

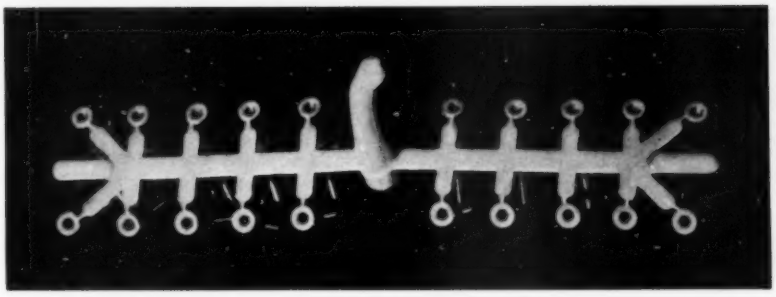

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Molded reinforced plastics. Mechanical, electrical, and chemical properties, uses, and other technical data on molded fibrous glass-reinforced plastics. Describes fabricating and finishing operations of six affiliated companies. 32 pages. *Molded Fiber Glass Companies, 4826 Benefit Ave., Ashtabula, Ohio.*

Alloys. Folder containing technical data sheets on how Cerro alloys are used in making dies, punches, models, patterns, molds, etc., including: "Electroforming . . . a Method for Producing Intricate Shapes" (8 pages); Cerro Alloy Physical Data and Applications" (4 pages); "Proof-Casting Cavities of Plastic and Rubber Molds, Forging Dies, Gun Chambers, etc." (2 pages); "How to Slush Cast Molds for Epoxy Encapsulation" (4 pages). *Cerro de Pasco Sales Corp., 300 Park Ave., New York 22, N. Y.*

Waste treatment. Properties, chemical resistance, applications, etc., of Dowpac, a plastic packing, which is used as surface media for the growth of biological slimes in trickling filter type biological oxidation towers. 24 pages. *Plastics Dept., Dow Chemical Co., Midland, Mich.*

Adhesives and coatings. Color, wet weight, temperature range, flammability, applications, coverages, drying time, thinners, etc., of Insul-Coustics adhesives and coatings for plastics, etc. 16 pages. *Insul-Coustic Corp., 42-23 54th Road, Maspeth 78, N. Y.*

Horizontal mixers. Dimensions, drive arrangements, mixer end and agitator details, inlet positions, gate assembly, etc., for a line of horizontal mixers. Bulletin F-1058. 12 pages. *The Young Machinery Co., Inc., Muncy, Pa.* *(To page 162)*

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Bimetallic cylinders. Properties, abrasion and wear resistance, corrosion resistance, applications, etc., for Xaloy and Xaloy-306 bimetallic cylinders used in the plastics, rubber, and other industries. 16 pages. *Industrial Research Laboratories, 961 E. Slauson Ave., Los Angeles 11, Calif.*

Injection molding machine. Specifications, features, uses, etc., for VMM-1 and VMM-2 vertical injection molding machine for insert, contact, and plug molding. 4 pages. *Progressive Tool & Die Co., 530 Boston Turnpike, Shrewsbury, Mass.*

"Moldable" fabric. Characteristics, uses, etc., of Celastic, a fabric impregnated with a solvent-activated plastic. 6 pages. *Wasco Products, Inc., Bay State Rd., Cambridge 38, Mass.*

Mold cavities. Facts about using Camin electroformed mold cavities in plastics moldmaking. 1 page. *Camin Laboratories, Inc., 104-14 S. Fourth St., Brooklyn 11, N. Y.*

Laboratory mills. Features, prices, etc., for laboratory mills for use with plastics and rubber. 2 pages. *Reliable Rubber & Plastics Machinery Co., Inc., 2003-14 Union Turnpike, North Bergen, N. J.*

Film and sheeting. Technical data kit containing general, mechanical, thermal, chemical, and permanence properties; samples; etc., of a line of thermoplastic films and thermoplastic flexible cellular sheeting. *Ludlow Papers, Inc., Needham Heights 94, Mass.*

Film Reviews. Folder listing six 16mm. black and white, sound, and color motion pictures available without charge. "Half-Second Butyrate —a protective coating for exterior aluminum surfaces" (15 min.); "The Case of the Disappearing Poison" (7 min.); "Butyrate Peelable Plastic Packaging" (15 min.); "Portrait in Plastics" (24 min.); "Plastic Pipelines" (30 min.); and "The Story of Tenite" (28 min.). 4 pages. *Eastman Chemical Products, Inc., 260 Madison Ave., New York 16. N. Y.*

Teflon lab. products. Description, sizes, prices, etc., of a line of Teflon laboratory products. Bulletin TP-1. 8 pages. *Kontes Glass Co., Vineland, N. J.*

Phenolic molding compound. Physical properties, cure time, dimensional stability, etc., for Durez 16771 Natural, a high- (*To page 164*)

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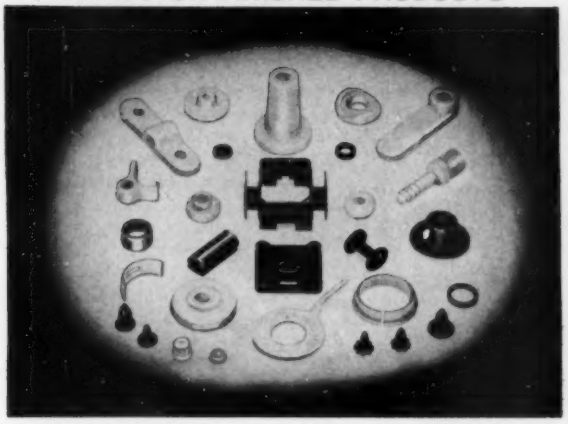

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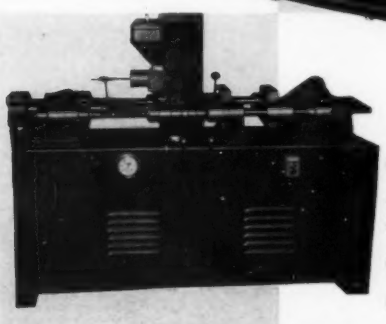

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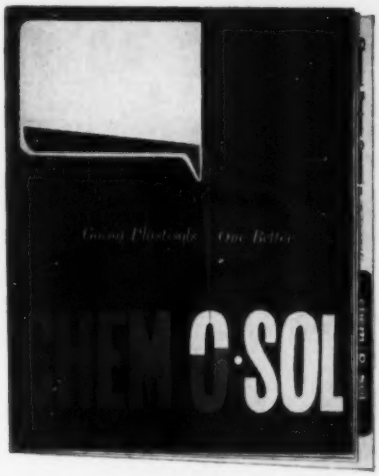

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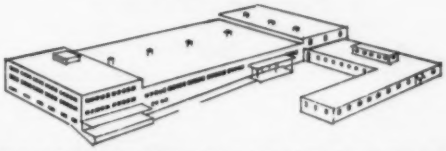

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impact phenolic molding compound reinforced with fibrous glass. 6 pages. *Durez Plastics Div., Hooker Chemical Corp., North Tonawanda, N. Y.*

Economics of Unscrewing Molds. Explains how cost can be greatly reduced by standardizing mold-base designs to accept interchangeable parts. 8 pages *Newark Die Co., 24 Scott St., Newark, N. J.*

Production facilities. "Winner Makes All" illustrates the variety of reinforced plastics applications produced by this firm. 8 pages. *Winner Mfg. Co., P. O. Box 399, Trenton, N. J.*

Intensive mixers. Specifications, applications, sizes, etc., of a line of intensive mixers for plastics and rubber. Bulletin 59. 12 pages. *Stewart Bolling & Co., Inc., 3190 E. 65th St., Cleveland 27, Ohio.*

Methyl ethers of hydroquinone. Physical and chemical properties, specifications, toxicity, applications, etc., of hydroquinone dimethyl ether and hydroquinone monomethyl ether, which are used as a stabilizer for certain monomers; acrylonitrile, styrene, acrylates; weathering agents; etc. 16 pages. *Ansul Chemical Co., Chemical Products Dept., Marinette, Wis.*

Plastics industry in Russia. "Report on Visit of U.S.A. Plastics Industry Exchange Delegation to U.S.S.R." 62 pages. Price: $2.00. *The Society of the Plastics Industry, Inc., 250 Park Ave., New York 17, N. Y.*

Silicone coatings. Advantages of using Syl-Off, a silicone anti-adhesive paper coating. 4 pages. *Dow Corning Corp., Midland, Mich.*

Testing facilities. Describes testing, research, design, development, and inspection facilities available for materials, components, systems, and products. Bulletin 5801. 6 pages. *United States Testing Co., Inc., 1415 Park Ave., Hoboken, N. J.*

Aluminum silicate pigments. Properties, uses, etc., of aluminum silicate pigments used in the plastics and other industries. T.I. 1001. 4 pages. *Minerals & Chemicals Corp. of America, Menlo Park, N. J.*

Three-stage forming machine. Features, basic operation, uses, etc., for the Rotary-Vac three-stage forming machine, which handles plastic sheets up to 4 by 6 feet. 4 pages. *Comet Industries, 9865 Franklin Ave., Franklin Park, Ill.*—END

Plastics digest

(From page 56)

to one-sixth of the original thickness. Upon cooling it remains compressed. When reheated the material will return to almost its original dimensions.

Plastic metals minimize plant shutdowns. R. B. Norden. Chem. Eng. *65*, 150, 152 (Nov. 3, 1958). Metal-plastic putties used to repair chemical processing equipment contain about 80% powdered metal and 20% plastic; a curing agent is added prior to application. Powdered iron, steel, or aluminum are mixed with resins such as epoxies. Techniques for repairing equipment are presented.

Properties

Temperature dependence of the rate of mechanical destruction of high polymers. N. K. Baramboi. Zhur. Fiz. Khim. *32*, 1248-51 (1958). Polyisobutylene, polyvinyl alcohol, and PVC were ground in a ball mill for several hours. The resulting viscosity or molecular weight was measured. Degradation was small when the polymers were in the glassy state, but large when the polymers were above the glassy transition temperature.

Influence of speed of stretching on orientation and crystallinity of polyethylene. R. Kaiser. Kolloid Zeit. *158*, 6304 (1958). Twenty-micron-thick films of low density polyethylene were stretched at three pulling rates differing by a factor of 10,000. Crystallinity and orientation were the same at the three speeds.

Study of the linear expansion of polymers. R. I. Feldman. Kolloid Zhur. *20*, 220-28 (1958). The coefficient of thermal expansion (α) of polymers depends on their pretreatment. The maximum α for polymethyl methacrylate (PMMA) was 0.00012 per °C.; α for polystyrene (PS) was 0.0006 to 0.00021, for PVC 0.00005 to 0.00021, and for a copolymer of 85% vinyl chloride and 15% vinyl acetate 0.00009 to 0.00018. These effects show also in the temperatures for various transitions. The literature lists 16 transition temperatures for PMMA, 28 for PS, and 21 for PVC.

Mechanical dynamic properties of some plasticized high polymers. M. Baccaredda, E. Butts, and R. Caputo. Chim. e ind. *40*, 356-61 (1958). The velocity of sound and the internal dissipation were studied in plasticized PVC and polystyrene from —70 to 120° C. *(To page 166)*

in a frequency field of 1 to 10 khz. The velocity of sound decreased with increasing plasticizer content, except at low temperatures. Internal dissipation increased with increasing temperatures and increasing plasticizer content. Diagrams of sound velocity and internal dissipation are given for both polymers with a variety of plasticizers.

Tensile and compressive properties of glass fiber reinforced laminates. R. E. Chambers and F. J. McGarry. ASTM Bull. No. 233, 40-44 (Oct. 1958). A newly developed technique using integrally bonded foil resistance strain gages permits interior distortion measurements through the thickness of glass-fiber-reinforced plastic laminates. This makes possible a detailed examination of orthotropic theory and an evaluation of the effects of certain parameter variations to better understand laminate behavior. Detailed studies of tensile, compressive, and flexural actions establish a consistent correlation between such actions and indicate that partial failure of the resin during tensile stressing takes place both in uniaxial and flexural tests. This failure, indicated by the knee in the stress-strain curve, has been further verified by moisture absorption under prolonged water immersion of laminate specimens before and after tensile stressing. Practical implications of this partial internal failure are noted.

Testing

Colorimetric determination of hexamethylenetetramine in molding compounds. D. Beranova and S. Hudecek. Chem. prumysl. *8*, (33) 218-20 (1958). Free hexamethylenetetramine in phenolic molding compounds and moldings may be determined by acid hydrolysis of the water-soluble *N* compounds, steam distillation of formaldehyde, and colorimetric determination with a methyl violet reagent. The error is ± 2 percent, better than for the Nessler reagent or iodometric method.

Flame resistance of neoprene. D. C. Thompson, J. F. Hagman, and N. N. Mueller. Rubber Age *83*, 819-24 (Aug. 1958). A new testing apparatus and the experimental techniques for evaluating the flame resistance of elastomeric materials have been developed. An electric arc is used as the heat source and heat is reflected by means of parabolic reflectors onto the specimen. Light filters are used to control the temperatures, which are measured by thermocouples mounted near the *(To page 169)*

specimen. Vapor ignition temperature, kindling temperature, breaking time, and flame propagation rates were measured on a number of specimens while they were being subjected to various tensile stresses. The effects of fillers and plasticizers on the flame resistance were also measured.

Chemistry

A new approach to the problem of stereospecific polymerization. M. Szwari. Chem. and Ind. no. 48, 1589-90 (Nov. 29, 1958). The possibility of stereospecific polymerization by means other than through the use of heterogeneous catalysts of the Ziegler-Natta type is suggested. The results of several recent investigations are cited as evidence for the potentiality. The method includes the use of poor solvents to encourage helical formation of the polymer. Good solvents encourage random-coil shapes.

Tracer technique in polymer chemistry. J. C. Bevington. J. Sci. Ind. Research *17A*, 106-12 (1958). Carbon 14-labeled azodiisobutyronitrile and p-benzoquinone were used as initiators to study minor constituents in polymers. The production, properties, and assay of radioisotopes for use in polymer chemistry are described.

Publishers' addresses

A.S.T.M. Bulletins: American Society for Testing Materials, 1916 Race St., Philadelphia, Pa.
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Chimie et Industrie: Presses Documentaires, 28 Rue Saint Dominique, Paris 7, France.
Journal of Science and Industry Research: Council of Sci. & Ind. Research, Old Mill Rd., New Delhi 1, India.
Kolloid Zeit.: Verlag von Dr. Dietrich Steinkopff, Holzofallee 35, Darmstadt, Germany.
Kolloid Zhurnal: Izdatel'stvo Akademii Nauk, USSR, Moscow, USSR.
Kunststoffe: Karl Hanser Verlag, Leonard-Eck-Strasse 7, Munich 27, Germany.
Modern Castings: American Foundrymen's Society, Golf and Wolf Rds., Des Plaines, Ill.
Modern Packaging: Breskin Publications, 575 Madison Ave., New York 22, N. Y.
Plastics Technology: Bill Brothers Publishing Corp., 386 Fourth Ave., New York 16, N. Y.
Product Engineering: McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York 36, N. Y.
Rubber Age: R T. Vanderbilt Co., Inc., 230 Park Ave., New York 17, N. Y.
Zhurnal Fizicheskoi Khimii: Izdatel'stvo Akademii Nauk, USSR, Moscow, USSR.
Zhurnal Prikladnoi Khimii: Izdatel'stvo Akademii Nauk, USSR, Moscow, USSR.—END

Plastics patents

(*From page 54*)

Polymers. G. A. Clark, C. B. Havens, and R. G. Brookens (to Dow). U. S. 2,858,293, Oct. 28. Chloroethylene polymers stabilized with beta resorcylic acid diesters.

Polymerization. H. Jenkner (to Kali-Chemie). U. S. 2,858,294, Oct. 28. Polymerizing dialkylsiloxanes with aluminum-containing compounds.

Polymers. S. Melamed (to Rohm & Haas). U. S. 2,858,295, Oct. 28. Unsaturated thioureido ether polymers.

Vulcanization. F. B. Stilmar (to Du Pont). U. S. 2,858,296, Oct. 28. Vulcanization of polyurethane elastomers with diisocyanates.

Polymers. S. Melamed (to Rohm & Haas). U. S. 2,858,297, Oct. 28. Polymers of vinyl sulfides of substituted ureas.

Compositions. J. G. Burt (to Du Pont). U. S. 2,858,298, Oct. 28. Curable polyalkylene-ether glycol compositions.

Resin. C. Boresch, W. Hagge, and M. Quaedvlieg (to Bayer). U. S. 2,859,186, Nov. 4. Condensates of trimethylol phenol and phenol polyamines.

Emulsions. M. T. Harvey and P. L. Rosamilia (to Harvel). U. S. 2,859,192, Nov. 4. Combinations of polyvinyl emulsions and acetone-formaldehyde resins.

Resins. R. J. Reid, W. M. Smith, Jr., and B. H. Werner (to Firestone). U. S. 2,859,194-5-6-7, Nov. 4. Plasticizers for vinyl resins.

Resin. E. E. Parker (to Pittsburgh Plate Glass). U. S. 2,859,199, Nov. 4. Polymerizable mixture of styrene and a polyester.

Polymer. C. A. Uranek, R. J. Sonnenfeld, and D. F. Dodgen, Jr. (to Phillips). U. S. 2,859,201, Nov. 4. Graft-type polymer of conjugated diene and acrylic acid.

Resins. E. F. Fiedler and F. P. Florentine, Jr. (to General Electric). U. S. 2,859,203-4, Nov. 4. Impact-resistant resins.

Resins. F. J. Lection (to Monsanto). U. S. 2,859,205, Nov. 4. Styrenated phenolic resins.

Resins. R. Polansky and W. F. Herbes (to American Cyanamid). U. S. 2,859,206, Nov. 4. Thiourea-urea-formaldehyde resins.—END

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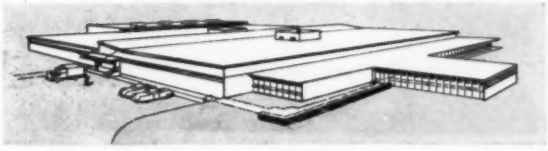

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Peroxide half-life

(From pp. 135-144)

difference between *t*-butyl hydroperoxide-90 and *t*-butyl hydroperoxide-70 in the polyester resin, but in the relatively inactive diallyl phthalate the activating effect of the dialkyl peroxide is again apparent because of the great variation between the two products in the hydroperoxide activity scale.

The authors express their appreciation to Dr. F. Visser 't Hooft, President, Lucidol Division, Wallace & Tiernan, Inc., Charles E. Rybolt, Director, Chemical Divisions, Wallace & Tiernan, Inc., and Dr. James B. Harrison, Chief Chemist of the Lucidol Division, for reviewing the manuscript and offering many helpful suggestions.

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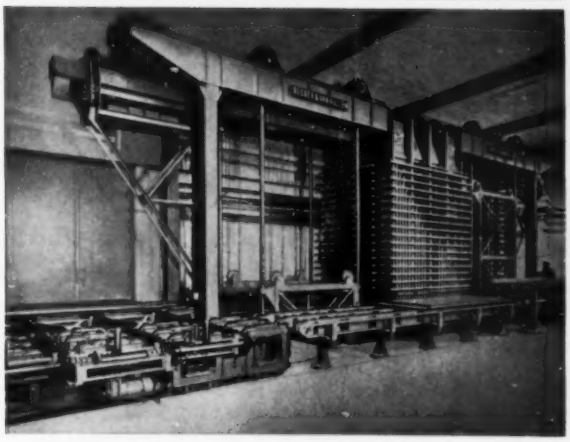

PE environmental

(*From pp. 146-151*)

published method (1, 2) now reads as follows:

"Place 10 specimens with the controlled imperfection up, in the slots provided in the bending clamp, close the clamp by means of a vise, arbor press, or other suitable aid, within 30 to 35 sec. Place the transfer tool in position on top of the closed clamp and close it over the specimens. Then lift the specimens from the clamp with the transfer tool and place in the channel by releasing the transfer tool."

Those laboratories concerned with medium- and high-density polyethylenes generally condition specimens by annealing for 1 hr. at the temperatures shown above in air ovens or autoclaves in place of boiling water temperatures. They are then equilibrated to 23° C. and tested within 24 hours. The specimens are neither bent nor treated with reagent until immediately prior to test. It should be remembered that the proposed method in any version has never been sent to ballot of either Section J on polyethylene, or Subcommittee XV on thermoplastic materials, or Committee D-20 on Plastics.

Acknowledgment

The contributions of the following members of the Task Group in performing the extensive work in all the round robins, in the interpretation of the data, and in guidance of the program, represent a monumental effort without which this test would be an unknown entity; the plastics industry should be grateful to this group for their efforts as is Committee D-20 on Plastics of A.S.T.M.: R. M. Berg, Union Carbide Chemicals Co.; A. R. Blanck, W. R. Grace & Co.; P. J. Boeke, Phillips Petroleum Co.; W. E. Brown and W. J. Sauber, Dow Chemical Co.; W. C. Fergusson, Imperial Chemical Industries, Ltd.; J. H. Heiss, J. B. Howard, and V. L. Lanza, Bell Telephone Labs.; C. V. Holland, Continental Can Co.; J. C. Luz, Union Carbide Plastics Co.; J. G. Pick and E. Y. Wolford, Koppers Co., Inc.; A. Rudin, Canadian Industries, Ltd.; J. G. Stranch, Jr., Tennessee Eastman Co.; W. E. Sweeney, Texas Eastman Co.; A. C. Webber, Du Pont; C. E. Woodard, Monsanto Chemical Co.; H. W. Woodham, National Petro-Chemicals Co.

Special acknowledgment should be extended to J. B. Howard, J. de Coste, V. L. Lanza, and J. B. Heiss of the Bell Telephone Laboratories for the initial work leading to consideration of the method by A.S.T.M., and for their continuing cooperation and help throughout this study.

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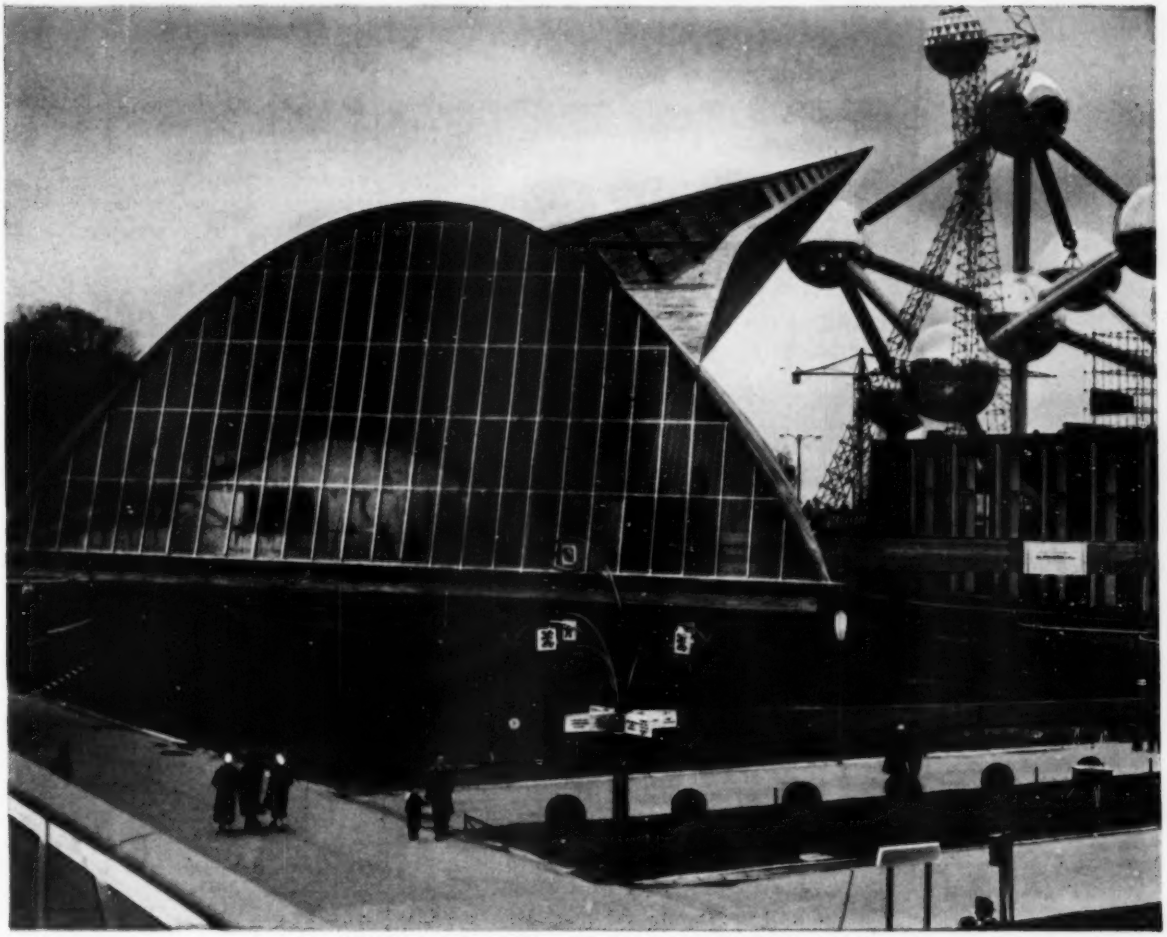

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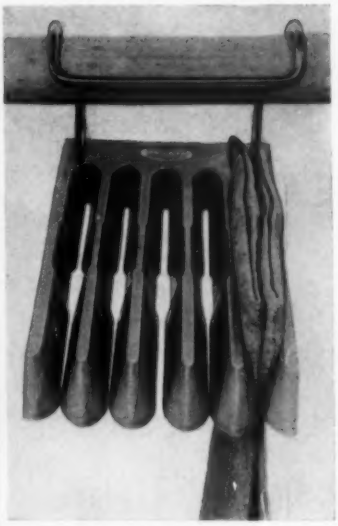


CLOTHES HANGER molded of styrene-acrylonitrile copolymer has V-shaped slots to hold five pairs of pants or skirts. It replaces the higher-priced wooden hanger.

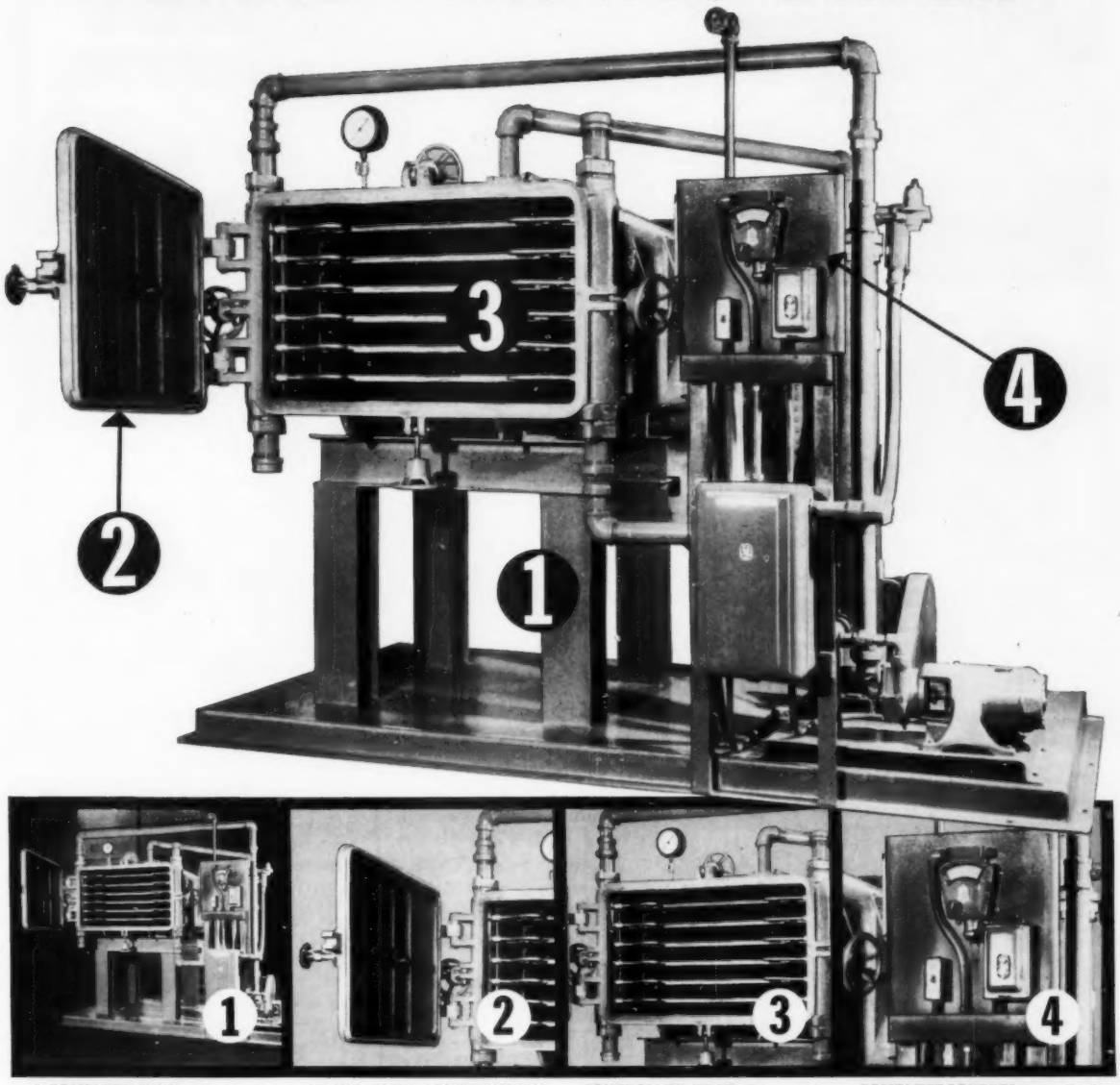
Molded multiple hanger

By switching from wood to a copolymer material for a multiple clothes hanger that holds five pairs of pants or skirts, the manufacturer was able to cut the retail price drastically. The new hanger, produced by the Glines Co., Glenbrook, Conn., sells for $3.95. This price compares favorably with the $5.95 wooden model that was formerly available.

Molded of Tyril styrene-acrylonitrile copolymer (Dow Chemical), the hanger employs a flexible V-shaped slot design that adjusts to the weight of the garment. Because of the flexibility of the product, horizontal pressure is exerted on cuffs or skirt tops to hold the garments in alignment. The clothes can easily be inserted or removed from the open ends of the slots.

The unit is molded by U. S. Plastic Molding Corp., Wallingford, Conn. The metal bracket by which the unit hangs from the clothes closet pole is molded in. The styrene-acrylonitrile copolymer was chosen for this application because of all materials tested it provides the best combination of rigidity, impact and crack resistance in an easily molded thermoplastic material.—END

DEVINE PLASTICS DRYER



A COMPLETE UNIT with vacuum pump, condenser, piping and hot water heating system.

HEAVY DUTY CONSTRUCTION Door is equipped with parabolic dove-tailed rubber gasket.

CONTROLLED HEAT Trays rest on heating platens uniformly distributing heat.

COMPLETE CONTROL Centralized control panel places operator in complete control.

Saves drying time — — cuts costs

The Devine Standard Vacuum Chamber Dryer, the result of 50 years' experience in the process equipment field, offers a fast, inexpensive, safe drying method for all plastics, virgin or scrap.

The "Devine Method" of low temperature vacuum drying means safe drying for heat-sensitive plastics, removes danger of discoloration. Another advantage: overnight storage–dried material is kept under vacuum, can be used next day without redrying.

The Devine Dryer is a complete unit, wired and piped and equipped with its own platform, needs only water and power line connection for installation.

Devine Dryers are available in standard sizes from 2 to 846 sq. ft. effective pan surface or produced in a size to meet your needs. Write for complete details on Plastics Dryers and other products for the Plastics Industry such as ribbon mixers for plasticizing, conical-blenders, and roll mills, or for answers to your specific problems.

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Magnets in polyester

Costing only one-fourth to one-sixth as much as comparable electromagnetic units, a new lifting tool for material handling in the metal-working industry takes advantage of the good adhesion quality of a polyester resin plus permanent magnetic elements which set up a powerful magnetic field that extends only 1/16 in. from their faces. Called the Bearpaw, the unit is reported to be capable of lifting more than 300 lb. of iron or steel.

The new device is 6 in. square, 1 in. thick, weighs only 5 lb., and is provided with a large pivoted handle in the center.

In manufacturing the Bearpaw, its metal housing is placed upside down and the permanent magnetic elements are located in position. The housing is then filled with liquid polyester resin (Vibrin, supplied by Naugatuck Chemical Div., U. S. Rubber Co.). When the resin hardens, it adheres firmly to the housing and the magnetic elements and is reported to be capable of withstanding several times the lifting force of the magnets without shearing.

In use, the tool is placed on the material to be moved and the lift is made by hand or winch. To disengage, the handle is pushed forward, forcing its cam-shaped end against the object and prying the magnetic elements free.

The Bearpaw was developed by Smith's Magnet Sales Co., Whittier, Calif.—END

PERMANENT MAGNETS, firmly embedded in polyester resin, are working elements of metal-handling tool.

Four new packaging uses for PE film

The heavy stream of new applications for polyethylene film packaging continues unabated. Among the latest products to be packaged in the film are 1) Christmas trees; 2) men's suits for shipment; 3) fruit juice concentrates; and 4) legume inoculant.

1) Polyethylene film made it profitable for E. B. Robbins, Rangeley, Me., to ship Christmas trees to new markets throughout the country during the past Christmas season. The moisture-proof film helps keep trees fresh during shipment and storage even in hot, dry climates. In addition, it protects the trees from damage, reduces fire hazards, and eliminates littering by fallen pine needles. The film package also reduces shipping space required for the trees to only half that needed for the trees tied with rope. Mr. Robbins found that only 400 lb. of film were needed to wrap 6000 trees, ranging in height from three to seven feet. Using a funnel-shaped device to guide trees into film tubes two men can package over 500 trees during one working day.

2) In an extension of an old application, polyethylene film is being used to package men's suits by the manufacturer. Wrapped in paper, men's suits often arrive at retail outlets badly wrinkled and have to be repressed before display. This, of course, is an added cost to the retailer.

The plastics film delivers the suits in acceptable shape, and also offers better protection against dust, stains, and tearing. In addition, the new suits can be placed on racks in the store without removing the film, while paper has to be removed for customer inspection of the garments. Grossman Clothing Co., New York, N. Y., is covering about 800 suits a day with a Mehl Manufacturing Co. (Cincinnati, Ohio) machine which dispenses preprinted tubular film. Just as used in dry cleaning establishments, the film is pulled over the suit manually and then heat-sealed and cut to size by pushing a foot lever.

3) A large fruit juice con-

POLYETHYLENE-LINED carton is being filled with fruit concentrate from large tank by means of polyethylene tube, while employee examines previously drawn sample as part of quality control procedure.

centrate producer, Orange Products, Inc., Chicago, Ill., has reduced its shipping costs 67% by switching from metal pails to corrugated containers with 3-mil polyethylene film bag liners. The heavy metal pails, discarded after each use, were more expensive to buy and to ship than the new containers. Other savings result from reduced space required by the rectangular film-lined package. The liners are sealed at the top by gathering, twisting, and binding them with a paper-covered wire.

4) Used for packaging legume inoculant, polyethylene film enabled the Nitragin Co., Milwaukee, Wis., to bring growers an improved product with no increase in price. Nitragin recently brought out a new additive. Normally such a product improvement means an increase in price. In this case the cost of the additive was absorbed by the savings realized in changing the method of packaging. Formerly, fiber cans were used; polyethylene film bags cost 50% less, and reduce the cost of outer cartons by 15 per cent. With the bags, smaller cartons can be used because of the more economical way the flat bags use the space inside the box.

Film used in the first three applications was made from Bakelite polyethylene, Visking in the last.—END

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Ester Content	99.0% min.

Other Uses—
Vinyl chloride resins, copolymers and plastisols, safety glass and safety plastic interlayers, cellulose acetobutyrate, neoprene and acrylonitrile-butadiene copolymer low temperature formulations, rubber hydrochloride films.

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Appearance	Clear liquid
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Odor	Faint
Specific Gravity, 20/20°C	0.972 ± 0.003
Free acidity, as acetic acid	0.01% max.
Ester content	99.0% min.

Other Uses—
Vinyl chloride resins, copolymers and plastisols, nitrocellulose, ethylcellulose, acrylates, natural and synthetic rubbers and polyvinyl butyral.

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RADIANT HEATING UNITS. Technical data sheets describe lines of commercial ceiling radiant heat panels for industrial plants and commercial buildings—particularly where there are unusually high ceilings or extreme exposures. Units eliminate drafts convection air currents. Ampere Industries. **(C-901)**

URETHANE FOAMING RESIN. 12-page illustrated brochure and series of technical bulletins give catalysts, mold release agents and molding techniques for a urethane foaming resin. Applications include wall insulation, sandwich prefabrication, unit insulation in refrigeration equipment. Thiokol Chemical Corp. **(C-902)**

PLASTIC EXTRUSIONS, 2-COLOR EXTRUDER. Catalog lists and gives prices for this company's lines of belting, bindings, pipes, etc. Gives prices. Also describes a new vertical extruder that adds contrasting stripes to insulated wire, tubing, etc., for decorative or identification purposes. Thermoplastic Processes, Inc. **(C-903)**

LIFTING MACHINE. Illustrated data sheet describes a line of 750-lb.-capacity "Shoplifter" models for die handling work, stacking in narrow aisles, and the loading and unloading of trucks. Economy Engineering Co. **(C-904)**

INDUSTRIAL WATER CHILLERS. 4-page brochure describes a line of air cooled chillers designed to furnish refrigerated water for industrial applications. Units provide for 100 per cent water recovery. Saren, Inc. **(C-905)**

PARTS MARKING MACHINES. 6-page illustrated brochure describes lines of machines for marking, numbering and stamping of plastics unhardened steel, brass and other metal and alloy pieces and parts. The Acromark Co. **(C-906)**

TEFLON COATINGS. 8-page illustrated brochure describes advantages of Teflon coated metal surfaces, including resistance to acids, rust and corrosion; self-lubrication, quick release, etc. Industrial Plastic Coating Corp. **(C-907)**

VACUUM FORMERS. 4-page illustrated brochure describes a line of vacuum formers said to be the only vacuum forming machines having two counteracting platens which are electrically driven and independently controlled. Each platen permits versatile thermoplastic sheet forming operations utilizing all known forming techniques on one machine. Comet Industries. **(C-908)**

HAND TOOLS, ACCESSORIES, 12-page catalog describes and gives prices for this company's lines of portable hand tools, power grinders, mandrels, special drill sets, abrasive bands, saws, steel cutters, abraders, etc. Chicago Wheel & Mfg. Co. **(C-909)**

CUSTOM FABRICATION SERVICE. 4-page illustrated brochure describes this company's custom services for the precision fabrication of Plexiglas, acetate, vinylite, styrene, Teflon, phenolics, etc. Parts include discs, washers, terminal boards, etc. Comco Plastics, Inc., Div. of Commercial Plastics & Supply Co. **(C-910)**

VACUUM FORMING MOLDS. 4-page illustrated brochure discusses advantages of this company's sprayed metal molds for drape, plug and vacuum forming, especially of transparent plastics. Brochure also discusses advantages and disadvantages of plaster and resin molds. Metalmold Forming Co. **(C-911)**

VOID DETECTOR. 4-page illustrated brochure describes a line of machines for locating and recording minute holes or voids in any material which is electrically nonconducting. Viking Instruments, Inc. **(C-912)**

EPOXY COMPOUNDS. Series of technical bulletins describe a series of epoxy molding powders for the manufacture of coil and resistor bobbins, relay assemblies, plastic models of forge dies, plastic shaper forms for chair bottoms, etc. Houghton Laboratories, Inc. **(C-913)**

SECONDARY PLASTICIZER. 10-page technical bulletin describes an odorless, water-white synthesized secondary plasticizer for vinyl resins. Contains test data and plastisol viscosity study. Continental Oil Co. **(C-914)**

MARKING MACHINE. 4-page illustrated brochure describes a foot pedal-operated bench-mounted machine for marking round, flat, concave, convex and irregular plastic, metal, etc. surfaces. Anderson Stanley Stamp Co. **(C-915)**

PLASTIC KNOBS. 16-page illustrated catalog gives specifications for this company's lines of standard thermosetting instrument and control knobs, dials and assemblies, available from stock tooling. Standard Parts Div., Kurz-Kasch, Inc. **(C-916)**

POLYSTYRENE FOR MACHINING. Pamphlet describes high-impact rod available in diameters up to 2½ in., tubing in diameters up to 3 in., and sheet up to 2 in. in thickness, for the machining of small parts. Westlake Plastics Co. **(C-917)**

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PHENOLIC RESINS, VARNISHES, MOLDING POWDERS. 8-page catalog describes product features, special properties, applications, etc. of lines of available phenolic molding powders, laminating varnishes, foundry resins, coating resins, and industrial resins, and varnishes. Chemical Materials Dept., General Electric Co. **(C-919)**

PLASTICIZERS FOR CHLOROFLUOROCARBONS. 5-page technical bulletin describes this company's special line of oils—low polymers of chlorotrifluoroethylene—for use as plasticizers in fabricating softer and more flexible shapes made of chlorofluorocarbon plastics. Halocarbon Products Corp. **(C-920)**

THICKNESS GAGES. 34-page brochure describes lines of non-contacting thickness gages for the measurement of sheet material. Units also measure the weight per unit area of a moving web. Tracerlab, Inc. **(C-921)**

PLATEN PRESSES. 4-page illustrated brochure describes this company's lines of four column presses, with platens guided on pre-loaded ball-bearing sleeves. Operation is said to be almost entirely free of friction. Machine & Tool Div., Lempco Industrial, Inc. **(C-922)**

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DECORATIVE VINYL SHEETING. 16-page illustrated brochure discusses features and fabricating techniques of this company's semi-rigid vinyl sheeting, available in colors and various finishes for bonding to steel and other non-ferrous metals. Applications include desk and table tops, luggage, seats, kitchen cabinets, advertising displays, etc. Columbus Coated Fabrics Corp. (C-923)

LATICES. 22-page illustrated brochure presents features and properties of lines of latices as used for the coating and impregnation of fabric, paper, leather, and non-woven constructions to impart superior abrasion resistance and tensile strength, good washing characteristics, etc. B. F. Goodrich Chemical Co. (C-924)

ELECTRICALLY HEATED TANKS. 12-page illustrated catalog describes this company's lines of electrically heated rectangular, low pressure, dispensing, and cylindrical tanks and pots for the heating of plastics, adhesives, etc. Sta-Warm Electric Co. (C-925)

ELECTRONIC CONTROLS. Catalog gives prices and specifications for this company's lines of recorders, controllers, indicators, control accessories and combustion safeguards and accessories. Wheelco Instruments Div., Barber-Colman Co. (C-926)

HYDRITE KAOLINITES IN REINFORCED PLASTICS. 20-page brochure describes the advantages, minerology and properties of, and mixing molding techniques for, this company's line of hydrite kaolinites in reinforced plastics. Also gives cost comparisons. Georgia Kaolin Co. (C-927)

INJECTION MOLDING MACHINES. Series of illustrated brochures describes this company's lines of 6- to 9-oz., 12- to 16-oz. and 16- to 20-oz. capacity hydraulic injection molding machines. Injection Molding Machine Div., Lombard Governor Corp. (C-928)

FILTERS FOR HYDRAULIC UNITS. 12-page illustrated catalog describes this company's lines of sump and line type filters for oils, coolants and lubricants in hydraulic injection molding machines, hydraulic pumping units, etc. Marvel Engineering Co. (C-929)

HEAT SEALERS. Illustrated brochure describes this company's lines of automatic heat sealers. Units perform standard operations and will also produce three dimensional appliques and edges in different colors. Cosmos Electronic Machine Corp. (C-930)

HYDRAULIC PRESSES. 28-page illustrated brochure describes this company's lines of plastic molding and special purpose presses. Standard platen sizes range from 20 by 20 inches to 50 by 50 inches. Hydraulic Press Div., The French Oil Mill Machinery Co. (C-931)

EXTRUDERS. Series of illustrated technical data sheets present features and specifications of this company's 1-, 1½-, 2-, 3-, 4½-, 6-, 8-, 10- and 12-in. variable speed extruders. Francis Shaw & Co., Ltd. (C-932)

REINFORCED PHENOLIC, MELAMINE MOLDING COMPOUNDS. 4-page illustrated brochure describes properties of this company's lines of reinforced molding compounds for use in the manufacture of automotive timing gears, electric drill housings, aqua lung housings, etc. The Fiberite Corp. (C-933)

MOLDING PLASTERS. 4-page brochure describes this company's lines of custom-made plasters for patterns, case and block molds, shell casts, etc. Bestwall CertainTeed Sales Corp. (C-934)

INJECTION MOLDING MACHINE. Illustrated data sheets describe features of an automatic 2¾-oz. horizontal plastics injection molding press, for plasticizing up to 30 lbs.-plus per hour. Includes specifications, prices. The Van Dorn Iron Works Co. (C-935)

POLYPROPYLENE. 10-page illustrated brochure discusses product and mold design, molding, processing, and fabrication of this company's lines of polypropylene. Uses include film, containers, pipe, business machines, etc. Cellulose Products Dept., Hercules Powder Co. (C-936)

PRECISION POWER TOOL. 4-page illustrated brochure describes a precision reciprocating hand machine for use in filing, lapping, scraping, honing and polishing delicate and intricate pieces such as dies and molds. Engis Equipment Co. (C-937)

LINEAR POLYOLEFIN RESIN. Series of technical bulletins discuss the properties, thermoforming, molding, extrusion, coloring and applications of "Fortiflex A", a high-density thermoplastic resin characterized by a linear structure. Plastics Div., Celanese Corp. of America. (C-938)

URETHANE FOAM TAPE. Series of illustrated data sheets describe a urethane foam tape used for insulation, cushioning and noise reduction. Tape is pressure sensitive and adheres to smooth, clean surfaces after removal of foil backing. Sample included. United Mineral & Chemical Corp. (C-939)

POLYESTER FILM. Series of illustrated booklets describe "Mylar", a polyester film used in the manufacture of wire, signs and decals, transformers, metallic yarn, pure sensitive tapes, decorative laminates, etc. Film Department, du Pont. (C-940)

PVC RESINS, COMPOUNDS. Series of technical data sheets list the properties, applications and processing procedures for this company's lines of PVC resins and compounds. Plastics Div., Diamond Alkali Co. (C-941)

MARKING MACHINES. 6-page illustrated brochure describes lines of hand- and air-operated precision machines for marking a variety of plastic parts including lipsticks, pen holders, name plates, control knobs, etc. Kingsley Stamping Machine Co. (C-942)

MELAMINE-FORMALDEHYDE MOLDING COMPOUNDS. Illustrated technical data file describes handling and molding of this company's "Cymel" molding compounds. Compounds are used in decorative applications for homes, offices, restaurants, etc.; also in industrial and military fields. Plastics and Resins Div., American Cyanamid Co. (C-943)

EXTRUDING EQUIPMENT. 6-page illustrated brochure describes a line of 1- to 8-in. thermoplastic extruders. Machines feature balanced heat control, quick-opening die gates and torpedo-type screws. National Rubber Machinery Co. (C-944)

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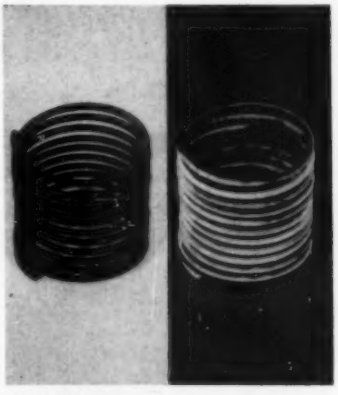
Fluorescent epoxy shows bonding flaws

Defectively bonded or coated parts may be quickly detected with virtually 100% accuracy, it is reported, when the bonding agents and coatings are new fluorescent epoxy compounds developed by Carl H. Biggs Co., Los Angeles, Calif. An ingredient of the compounds is a uniformly dispersed material which fluoresces when subjected to ultra-violet ("black") light. When a coated or bonded part is inspected under ultra-violet, it gives off a uniform glow if the epoxy has been properly applied; whereas defective areas of a part show up as black patches.

Uses for the compounds include bonding resistance wires to ceramic or plastic bases, coatings to moisture-proof transformers and motors, etc. One manufacturer of potentiometers states that adoption of the new epoxy compound and black-light inspection has reduced the reject return rate from a little over 10% to less than 2 percent.

While the fluorescent bonding and coating materials cost considerably more than conventional compounds, the reduction of fabrication costs and reject returns is reported to more than offset the higher price. This is particularly true for items that have a high unit cost.—END



FLUORESCENT epoxy coating on resistance coil (left) appears unbroken when photographed under ordinary light. When photographed under black light (right), however, coating flaws are easily detected.

Temperature extremes—which can rob vinyls of flexibility—are of little concern to producers who specify Plastolein low temperature plasticizers for their products. For example . . .

They know that Plastolein 9058 DOZ is the time-tested standard of the low temperature plasticizer field . . . that it provides the kind of low temperature flexibility *that stays in* their vinyls even after prolonged exposure to summer heat.

And more and more producers are utilizing the unusual capabilities of another Emery plasticizer, Plastolein 9078 LT, which approximates 9058 performance, but at a much lower price.

Why don't *you* investigate the advantage of these Plastolein Plasticizers in your coated fabrics, film, sheeting and extrusions?

Write Dept. F-3 for literature.

Emery *Plastolein® plasticizers*

Organic Chemical Sales Department

Emery Industries, Inc., Carew Tower, Cincinnati 2, Ohio

FABRICATED PIECES of rigid foamed polystyrene insulation board are placed in shell of freezer cabinet. As the assembly progresses, the pieces will be held in place by force fit; no adhesive is used.

Better freezers with styrene foam

Permanent efficiency of thermal insulation in refrigerated display cabinets for retail outlets is being achieved by at least one company through the use of rigid foamed polystyrene insulation board linings for the bottoms and all four sides of the cabinets. This firm, C. Nelson Mfg. Co., St. Louis, Mo., reports that it is using the foamed plastic material because of its moisture resistance, good thermal efficiency, structural strength, and the ease with which it can be fabricated.

Primary interest of Nelson in designing its new Automatic Defrost Merchandiser was to produce a unit which can be defrosted rapidly, brought back to operating temperature as quickly as possible, and that will maintain its refrigeration efficiency even if moisture should manage to seep through the sealed cabinet and penetrate the interior insulating material.

Chosen for the insulating job was Armalite rigid foamed styrene board, produced by Armstrong Cork Co., Lancaster, Pa. This material, with its closed cell structure and high insulation value (it has a K factor of .24 at 60° F. mean temperature), is extremely light in weight and completely odorless.

The cabinet itself is fabricated of welded steel sheet, with all flanges, seams, and any other openings where moisture might enter sealed with mastic. The insulation is set in place against the outer skin without the use of adhesives. Instead, the foamed styrene boards are cut slightly oversize and pressed into place for a force fit. After the inner liner is dropped into place, there is no possibility of the insulation shifting position.

The new cabinet, which has 6½ sq. ft. of open top and 6½ sq. ft. of glass in front, needs only two 15-min. defrost periods every 24 hours. It has an initial pull-down to zero in a 90° room of only 1 hour.—END

REFRIGERATED display cabinet has styrene insulation on bottom and four sides.

Double-use PE shipping tray

Use of the same tray for both shipping and serving of individual cups of cream and condiments has proved to be an economical and sanitary method of handling single-service portions for the packer and his customers.

The trays are vacuum formed by Vacuum Molding Co., Boonton, N. J., using W. R. Grace's Grex high-density polyethylene sheet. Although several other plastics were considered, Vacuum Molding selected high-density polyethylene because of its high impact strength and its high heat and excellent chemical resistance. The trays can be sterilized for repeated use over a long period of time.

As used by Raritan Valley Farms, Inc., a Somerville, N. J., dairy, each tray holds 42 individual cream cups. Seven trays can be stacked in a standard milk crate, to give a total of 294 creamers. Use of the trays also considerably simplifies the dairy's inventory control.

For refrigerated transportation of foods, the trays can be alternated with layers of crushed ice. Each cup holder has a cutout, honeycomb design that permits the melted ice to drain off and provides a cooling tower type of refrigeration.—END

DUAL-PURPOSE TRAY, formed of high-density polyethylene sheet, is used as a serving tray (top) or shipping tray (bottom) for individual cups of cream or condiments. Trays can be sterilized repeatedly.

ABS pump impellers

Complex pump impellers for home water systems, molded of ABS (acrylonitrile - butadiene - styrene) copolymer blend have replaced cast bronze units, thereby reducing fabrication costs and increasing the operating efficiency of the pump. The parts, injection molded of U. S. Rubber's Kralastic, are used in both sump and jet water pumps of the economy line of Barnes Mfg. Co., Mansfield, Ohio.

The bronze pump impellers formerly used by Barnes were relatively expensive to fabricate and difficult to produce to close tolerances in quantity. The ABS impellers come straight from the mold with no important variations in size or shape, and finishing costs are cut to the minimum.

PUMP IMPELLER parts injection molded of ABS resin have smooth surfaces, which contribute to greater pump efficiency. Less finishing is required than with the brass parts. Impeller for jet pump is at top, and component for sump pump at bottom.

In addition, the plastics parts improve the operating efficiency of the pumps in which they are used because of their smooth surfaces, which aid water passage. They also offer outstanding corrosion resistance.

Two different molders are involved: the sump pump impeller is molded by Portage Plastics, Kent, Ohio, while the unit for the jet pump is by General Industries Co., Marysville, Ohio.—END

THE PLASTISCOPE*

News and interpretations of the news

By R. L. Van Boskirk

Section 2 *(Section 1 starts on p. 41)*

March 1959

Polystyrene price changes

Color has always been a most prominent property of polystyrene molding material. But colored molding material has always sold at 3 to 4¢ premium over natural or crystal. Thus, when the recent price reduction on general purpose cyrstal was promulgated, considerable commotion was created when Dow followed the Monsanto price reduction on crystal but added that under certain conditions the premium on colors would hereafter be only 1½ or 2¢/lb. instead of the former 3 or 4¢ differential. These conditions are discussed below. This is one of the few times that the price for color was made subject to alterations.

Polystyrene prices for general-purpose crystal or natural color have been on the decline since 1953 when it stood at 32¢ and when the end of the Korean war eliminated all danger of a monomer shortage. In fact, capacity for polystyrene molding material is now estimated to be approaching 700 million lb. or more per year, while sales in 1958 were only around 450 million.

The recent Monsanto reduction in price of natural color crystal molding material from 24¼ to 21½¢/lb. is a reflection of this highly competitive situation; it also copes with price cutting practices that had arisen as a result of the capacity/sales unbalance. Styrene was being offered from some sources at less than list prices. It could be guessed that Monsanto not only aimed at these price cutters but made them wince by dropping the list price to an even lower level. There are several other factors involved in this price reduction including the benzene and styrene monomer situation, but it isn't safe to speculate about them until more accurate knowledge is available. It may be significant that Monsanto has also announced a 40 million lb. increase in rated capacity of its styrene monomer plant and a 0.7¢/lb. reduction in the bulk price of rubber-grade styrene monomer. Capacity for monomer production in this country is already far above demand but the ever-growing market for synthetic rubber made from styrene and butadiene is a tempting bait for styrene producers even though styrene plastics growth should level off. Benzene, used in production of styrene, was reduced from 36 to 31¢/gal. last December and foreign imports at an even lower price are on the way; but the above reduction is said to make only a ½¢/lb. difference in the cost of polymer.

The Monsanto price drop for polystyrene was met quickly by all other producers. One of the unusual features of this maneuvering is the fact that for the first time in the recent series of price reductions impact material was included with general-purpose material.

The price list issued by Monsanto now offers crystal at 21½¢/lb. compared with the former price of 24¼¢ in truckload quantities of 20,000 lb. and over. The medium impact, which was formerly 29½¢, is now 28 cents. High impact formerly 32¢ is now 31. A new formulation, Lustrex Medium 42, is 25¢—its degree of impact fits in between general-purpose and medium impact. The price differential between crystal and colored was raised to 4¢/lb. and colored impact resin is now 3½¢ over natural.

There are various other prices in polystyrene formulation such as the highest heat resistance which is 24¢ and super-high impact which is 38½ and, of course, the 3 to 4¢ premium for special colors.

Dow adds new touch. A new volume pricing policy has been announced by Dow. Dow calls its new pricing system for colored material "Volume Inventory Production," or VIP for short. It is essentially based on pooling of orders to permit production on the scale that allows a reduction from a premium of 3½ or 4¢ over uncolored polystyrene to 1½ or 2¢ a pound.

In practice, if the company receives one or several large orders for, say, "refrigerator white impact material" it is placed on the VIP list and customers are notified that "refrigerator white" will be available at a premium of only 1½¢ in truckload quantities over uncolored material instead of the customary 3½¢ premium.

The plan operates like this: By the fifth of each month a list of colors which Dow plans to produce as VIP colors will be given to all sales offices. Orders will be accepted up to the 25th of that month for production the following month. If the customer doesn't want his total order all at once, Dow will warehouse the material for 90 days commencing with the first shipment to the customer or the last day of the month of manufacture, whichever is earlier.

If orders for colors *not* on the VIP list (special colors, for example) are received in sufficient quantity to permit manufacture in minimum VIP volume, such orders will be priced at VIP prices. Dow will continue to deliver any size color order on short notice and, of course, will continue to produce "special colors" that are not on the VIP list but they will require pricing at the special color price. However, if a customer wants as little as 50 lb. of a VIP color he can buy it at a 2¢ premium over crystal and if he buys a whole truckload of miscellaneous *(To page 196)*

*Reg. U.S. Pat. Off.

News about R&A SINCE 1913 **Adhesives**

FOR ALL METALS AND ALL PLASTICS

This "100%-solids" adhesive flows like a heavy-bodied motor oil

TECHNICAL DATA ON

Bond*master*® M648T

A free-flowing, high strength, room-temperature-curing, 100%-reactive, two-component, formulated epoxy adhesive designed for bonding all metals and other rigid materials (such as glass, ceramics, plastics, plastic foams, and structural laminates) to themselves and to each other.

BOND CHARACTERISTICS

Fully cured bonds exhibit minimal shrinkage, are electrical insulators, and provide excellent resistance to weather, galvanic action, and most chemicals, acids, and alkalies.

APPLICATION

Mixed BONDMASTER M648T may be applied with trowel, spatula, knife, roller, brush, etc. Apply enough *mixed* BONDMASTER 648T to fill all cavities and depressions in both surfaces *and* to leave about 4 additional mils of adhesive on each side. Press together firmly to establish and maintain intimate contact, and cure. Pressure is not required during cure.

SPECIFICATIONS

VISCOSITY (mixed): about 10,000 cps. COLOR: clear, pale amber. BASE: modified epoxy. SOLIDS: 100%. HARDENERS: CH-8 for balance of all properties; CH-16 for best shock and peel strengths. WEIGHT PER GALLON: about 10 lbs. STORAGE: 1 year, unmixed. CONTAINERS: 1-gal. cans; 5-gal. pails; 55-gal. drums.

R&A SINCE 1913

RUBBER & ASBESTOS
CORPORATION
243 BELLEVILLE AVENUE
BLOOMFIELD, NEW JERSEY

Don't let the "100%-solids" term confuse you . . . this modified epoxy adhesive is a free-flowing liquid!

BONDMASTER M648T ("T" for "thin") exhibits all the smooth mixing characteristics and ease of handling of a 10,000 cps fluid—can be applied by brush, spatula, roller, spreader, or similar conventional equipment.

As with all BONDMASTER formulated epoxy adhesives, M648T yields high strength bonds on all rigid metals and just about any plastic or plastic laminate. In addition, its lower viscosity makes it ideally suited for work on flexible plastic sheets (like bondable Teflon) or fragile cells of rigid plastic foams (like Styrofoam) as well as on thin metallic foils of all types.

100% REACTIVE

The glue line thickness you put down won't shrink, either during the cure or after it . . . this formulation is 100% reactive. (There is no wait for solvent evaporation either.) Mere contact pressure is sufficient.

CURES AT ROOM TEMPERATURE

A bond that's strong enough to permit handling of your assembly develops at room temperature in from 4 to 6 hours; about 85% of maximum strength in less than one day. Alternately, if you can heat-cure, you can reach full strength far more rapidly—in as little as 10 minutes at 250°F., for example.

WRITE FOR FURTHER DATA

Write for Technical Data Sheet describing this 100%-reactive, free-flowing liquid epoxy adhesive formulation. We will be glad to send a free evaluation sample as well if you will describe your bonding problem in detail.

THE PLASTISCOPE

(From page 194)

colors, the company says that the VIP portion will be sold at the 1½¢ premium.

What markets will benefit. It is believed that by far the greatest volume of VIP colors will be in impact-grade material since the major consumer of impact material is the appliance market where large orders of one color are prevalent. The market in VIP general-purpose material may be less than 20 million lb. a year since there are few moldings in one color that require large enough quantities to take advantage of the VIP price. About one-third of all general-purpose resin sold today ends up as a molded crystal product. About one-third of all the crystal general purpose sold is subsequently colored by the molder himself. The man who does his own coloring generally requires a multiplicity of colors and may not be interested in VIP. But the man who uses a large quantity of one color may find it less costly to buy VIP than to do his own coloring.

Dow has preached this "lower price for big volume" idea a long time. A lower price for bigger volume is common practice in nearly all large commodity markets. Dow is hopeful that it will work out in polystyrene and even work to the advantage of the small volume user if he will take advantage of the VIP color selection.

Other producers have announced that they too will follow the Dow VIP price schedule and will give it a fair trial but are uncertain about the over-all amount of volume needed before a color can be listed as VIP. Some are cynical lest any order may eventually be listed as VIP and thus bring down the level of all color orders to a 1½¢ premium over crystal. This would be disastrous to their profit picture which is already endangered by the new 21½¢ price for crystal material. The Dow plan envisions, of course, that there will still be lots of business in the "special colors" classification where the 3 to 4¢ differential over crystal will be maintained and is aimed

(To page 198)

PRODUCT-DESIGN BRIEFS FROM DUREZ

- **A plastic for potentially hazardous locations**
- **Material for a non-warping switch**
- **More design freedom in metal castings**

Canopy retards fire

Good product ideas seem to work almost anywhere.

Take, for example, this plastic gas-station canopy. So far as we can tell, the idea of cool, light-diffusing canopies over the gas pumps started in the South, where it would seem to be a natural.

However, the canopy you see here is in Canada. It does most of its work in winter, when it may have to hold up the weight of five feet of snow and ice.

The marketing strategy is sound. A motorist doesn't mind so much getting out of his car in bad weather when he's protected overhead; and the attendant, too, is likelier to provide that extra bit of service.

There's something else that's different about this canopy. It doesn't support combustion, because it's made with Hetron® self-extinguishing polyester resin. A fire starting at a pump won't spread along the canopy to other pumps or to the station building.

If it weren't for self-snuffing Hetron, there'd be few places where a good idea like this could operate. Fire retardance is chemically locked into the resin, not added later at the expense of strength. The resulting combination of structural properties gives you something unique on which to base *your* new-product ideas.

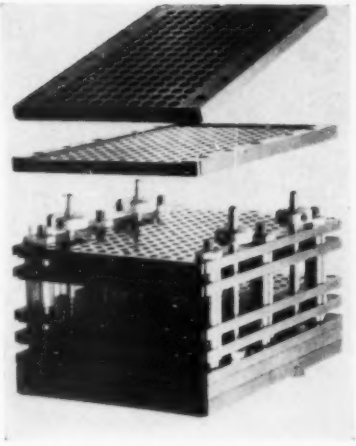
If you'd like to know more about Hetron resins, let us send you the complete technical data file, together with names of leading fabricators in this country and Canada who can make U/L-listed panels and custom-molded shapes for you.

Less dough for this "bread"

Needed: a dimensionally stable material for the "bread" in this sandwich-like multiple switch assembly (above right).

Why dimensionally stable? Because each of the seven "slices" in the sandwich has 187 holes that must line up with matching holes in the other plates.

What low-cost insulating material would hold alignment without risk of moisture absorption and warping? Could



holes be *molded*, rather than drilled, to the required accuracy? Would this save money?

The material recommended by the custom molder was a fast-curing Durez compound with good moldability and excellent dimensional stability. This material does everything the designers want it to do. Its exceptionally good mold release facilitates the low-cost molding of holes. In addition, numbers and letters which were formerly silk-screened on the plates are now molded-in for extra savings.

Result: a smooth-functioning, non-warping switch, produced with the utmost economy. It's just one more proof of the wide, wide spectrum of design requirements you can meet at low cost with Durez phenolics (and often *only* with phenolics). Want more information on these versatile molding compounds? Just check the coupon for a bulletin on Durez materials.

Castings – can do

Don't back off from a complex metal shape just because "it can't be done."

Instead, talk to your foundryman. He may have a surprise up his sleeve—*shell molding*. It saved the day for the aluminum-alloy gearbox cover, below.

Designers wanted as many heat-dissipating fins as possible; they compromised on 40. Even so, fins tore when the piece was poured in sand. Three men could produce only 20 good castings a day.

A switch to shell molding has made the casting economically feasible. Three men now turn out 70 per day. Dimensions are much more consistent from one casting to the next. As a bonus, engineers found they could squeeze two more fins into the design to get higher efficiency than they first believed possible.

What about cost? Shell-molded castings sometimes cost more *per pound* than regular castings. But they often save you far more than the difference—by reducing machining and finishing time and by speeding assembly.

Like to know how these better castings are made with the help of Durez foundry resins? We'll gladly send you the new 36-page "Durez Guide to Shell Molding" if you check the coupon below.

For more information on the Durez materials mentioned above, check here:

- ☐ Hetron fire-retardant polyester resins (50A)
- ☐ General bulletin on Durez materials (Bulletin 400)
- ☐ "Durez Guide to Shell Molding" (36-page bulletin)

Clip and mail to us with your name, title, company address. *(When requesting samples, please use business letterhead.)*

DUREZ® HOOKER CHEMICALS PLASTICS

PLASTICS DIVISION

HOOKER CHEMICAL CORPORATION

12003 Walck Road, North Tonawanda, N. Y.

THE PLASTISCOPE

(From page 196)

particularly at the market for impact-styrene in appliances.

Molders' opinions up to now are generally favorable to the price reduction but some of them complain that they won't know how to bid on a job because of uncertainty on whether or not the color they want will be on the VIP list.

In any case this lowering of the differential price between crystal and colored material in large quantity lots is a revolutionary step in the history of polystyrene and is going to be watched carefully for months to come.

Improved rigid vinyl sheeting

Three new formulations have been added to Union Carbide Plastics line of rigid vinyl sheet.

The first, VCAB-3603, is designed for unusually high impact in such products as book binding, playing cards or graphic arts materials. It is available in continuous or cut to size calendered sheet or press-planished.

The second, VCAB-3604, has superior light stability and suggested for such items as lamp shades or point of sale displays. It is available in translucent, opaque, and colors.

The third, VCAB-3606, has great resistance to heat distortion which makes it valuable in applications requiring proximity to heat or light.

The first two are produced in thicknesses ranging from 0.007 in. to 0.030 in. and the third ranges from 0.007 in. to 0.020 in. and in widths up to 51½ inches. All three formulations are notable for greater impact strength than was formerly available.

Styrene-acrylonitrile

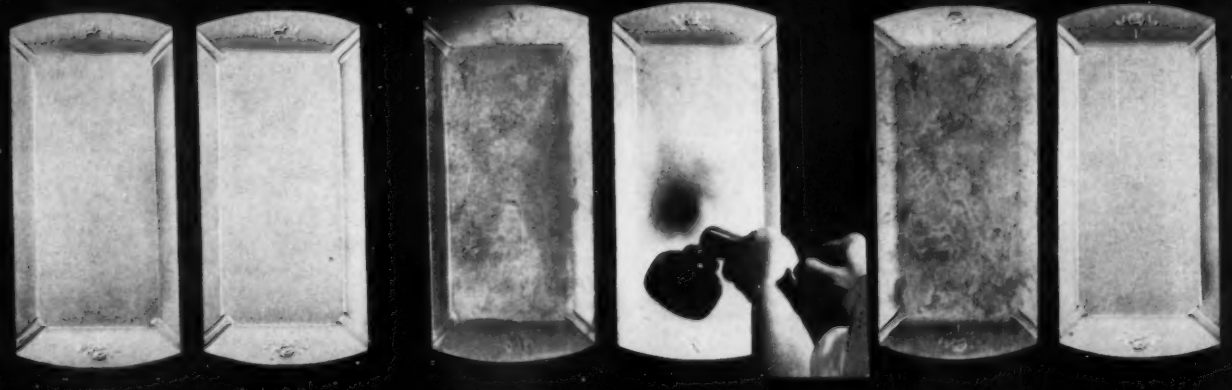
Foster Grant Co. has begun production of Fostacryl, a styrene acrylonitrile copolymer. Initial production is between 4 and 6 million lb. a year. F. G. is the fourth styrene producer to announce availability of this type material which is particularly noted for its resistance to acids and many other chemicals—it is sometimes called the "gasoline proof" styrene. Company spokesmen *(To page 200)*

NOW NEW FIRST and ONLY

static dissipating styrene molding powder

LUSTREX LO-STAT

Translate this test into new production economies and sales advantages:



1. Two trays from same mold. Left: molded of standard material. Right: molded of Lustrex Lo-Stat.

2. Charcoal dust is sprayed on both trays.

3. Result! Dust pattern on standard tray corresponds to static electric charge. Tray of Lustrex Lo-Stat is practically clean. The little charcoal remaining is easily tapped off.

Think what Lustrex Lo-Stat can mean in keeping housewares clean and appealing, how much longer signs, displays and packages will stay attractive. Air conditioner and fan grills are other moldings that will be improved. There are dozens of jobs that Lustrex Lo-Stat dust-resistant styrene can do better. And production economies include the elimination of spraying and bathing; open storage and simplified handling. Lustrex Lo-Stat is in full production. Send for a trial quantity now along with complete technical data. Monsanto Chemical Company, Plastics Division, Room 957, Springfield 2, Mass.

Monsanto

LUSTREX: REG. U. S. PAT. OFF.

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say that their technicians have overcome one of the difficulties generally accompanying the acrylonitrile copolymer—that is discoloration of the final material. Fostacryl is said to be almost crystal clear requiring only a minimum use of dyes to counteract the slight yellowing of the material encountered in processing. It is suggested for tumblers, dinnerware, pen and pencil barrels, food containers, fan blades and air conditioners. This is the fourth major molding material produced by Foster Grant in the eight years since the company became a raw materials producer. The others are general purpose polystyrene, high impact polystyrene, and nylon.

Dustless aluminum pigment for plastics

A new line of finely powdered aluminum in either plasticizer or mineral oil dispersions is announced by Silberline Mfg. Co., Stamford, Conn. There are three types available in either DOP or TCP as well as in mineral oil. Silvex 1000 is a 160 mesh grade, Silvex 2000 is a 325 mesh grade, Silvex 3000 is also a 325 mesh grade but has a greater coverage and hiding power.

The plasticizer-dispersed products are used for vinyl calendering and extrusion while the mineral oil pastes are used for molding materials of many kinds. Both Kralastic and Cycolac ABS molding materials are being offered so pigmented.

By the use of transparent or opaque dies in either the vinyls or molding materials it is possible to achieve metallic colors of all kinds including copper and bronze tones. Prime advantage claimed for this aluminum pigment is that it is explosion-proof and will not dust up a plant.

Fast curing resin

A new polyester resin for reinforced plastics applications requiring rapid cure at room temperature has been introduced by Rohm & Haas Co. Designated Paraplex P-463, the product is said to have *(To page 204)*

HEAT STABILITY OF PVC RESIN FORMULATED WITH DIFFERENT PLASTICIZERS

PLASTICIZER	Parts Per Hundred Parts of Resin	Heat Stability 2 hrs. @ 350°F.	Approx. Relative Cost* (Isosebacates = 100)
DIOIS (Diisooctyl Isosebacate)	50 60	Excellent Excellent	100
DOIS (Di-2-ethylhexyl Isosebacate)	50 60	Excellent Very Good	100
DOS (Di-2-ethylhexyl Sebacate)	50 60	Very Good Very Good	135
DIOS (Diisooctyl Sebacate)	50 60	Very Good Very Good	135
DOZ (Di-2-ethylhexyl Azelate)	50 60	Very Good Very Good	105
DOP (Di-2-ethylhexyl Phthalate)	50 60	Very Good Good	65
DIOZ (Diisooctyl Azelate)	50 60	Good Good	105
DOA (Di-2-ethylhexyl Adipate)	50 60	Fair Fair	90
DIOA (Diisooctyl Adipate)	50 60	Fair Fair	90
ODA (n-Octyl-n-decyl Adipate)	50 60	Fair Fair	90
DIDA (Diisodecyl Adipate)	50 60	Poor Poor	90

Formulations:	Parts	Parts
PVC	100	100
Plasticizer	50	60
Stabilizer A	2	2
Stabilizer B	1	1

Based on Aug. 1958 prices for finished plasticizers.

You get top heat stability at low cost by plasticizing vinyls with esters of ISOSEBACIC® acid

Dioctyl and diisooctyl esters of ISOSEBACIC® acid excel over the commonly used sebacates, azelates, adipates and phthalate as heat-stable plasticizers for vinyl resins.

The above table of data from a series of comparative tests shows the outstanding heat stability of Isosebacates. In these tests, samples were cut from sheets of various polyvinyl chloride formulations prepared by standard milling and pressing techniques. Four sets of each were heated at 350°F., with one set removed at each half-hour interval over a two-hour period. Stability was rated according to the degree of discoloration.

DOP was included in these tests since it is often used in blends to increase the compatibility of other plasticizers.

Key to Quality

To manufacturers of such vinyl products as luggage, auto seat covers, handbags, shower curtains, garden hose and footwear, heat stability is a vital property. With ISOSEBACIC acid-derived plasticizers, they get top heat stability—and good color, odor, low-temperature flexibility, and resistance to oil and soapy water extraction as well.

Costs, too, are well below those possible with the best of the other low-temperature vinyl plasticizers.

ISOSEBACIC acid is a mixture of three C-10 dibasic acids—2-ethyl suberic, 2,5-diethyl adipic and sebacic acids. It is a new U.S.I. organic intermediate being evaluated for polyamides, polyesters, polyurethanes and alkyds as well as vinyl plasticizers.

Why not see for yourself how these properties can improve your quality-cost picture? Send for literature and samples of ISOSEBACIC acid, soon to be produced in commercial quantities at Tuscola, Ill.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corp.
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. . . the urgent need to help scientific education in the United States today.

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Please do it now—while it's fresh in your mind.

EDITOR,

MODERN PLASTICS ENCYCLOPEDIA ISSUE

575 Madison Ave., New York 22, N.Y.

THE PLASTISCOPE

(From page 200)

the advantages of fast wetting of glass fibers; rapid development of tack-freeness and hardness, even at low catalyst concentrations; and freedom from sagging on a vertical surface when used with glass mat, roving, or cloth.

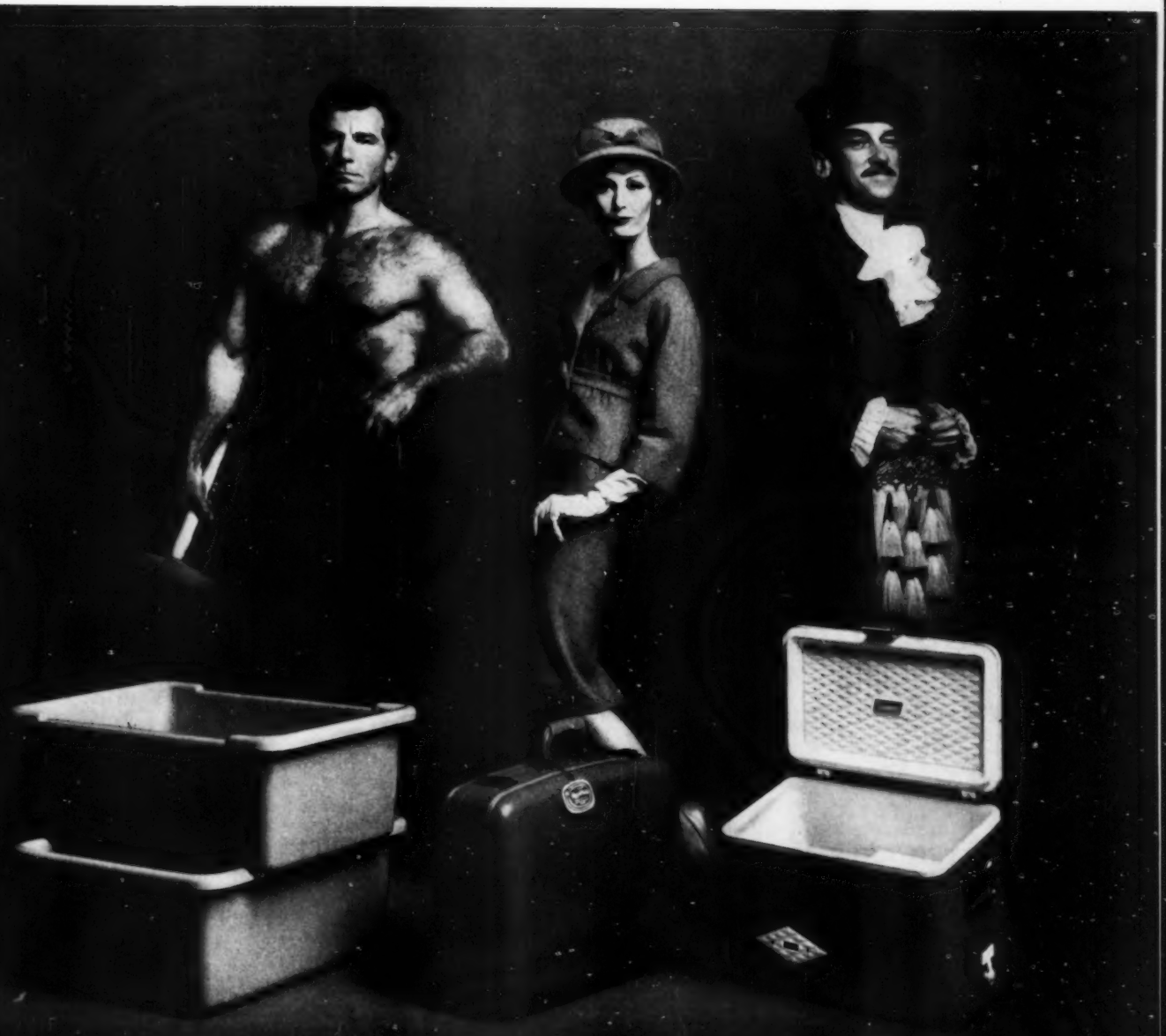
The new resin is claimed to make possible high-speed large volume production in air-cure operations, and is expected to find especial application in the boating industry.

Formable paper-plastic laminates

Laminates of kraft paper and thin-gage plastics films that can be easily thermoformed on conventional equipment are a recent development of Cincinnati Industries, Inc., Cincinnati, Ohio. The paper used in the laminations is a special X-Crepe produced by Cincinnati Industries with a high degree of all-directional stretch—so much so that the thermoplastic film and paper combinations can stretch as much as 60% during the forming process without breaking. Development work has indicated that forming may be done on mechanical, hydraulic, or air pressure presses using male, female, or matched dies.

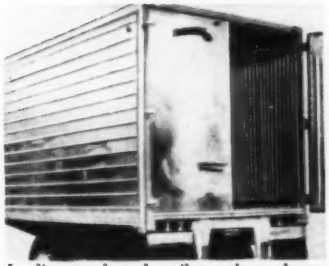
The laminates range in thickness from 15 mil to ¼ in. or more, depending upon the number of plies. Among the materials already successfully laminated to the paper and formed are acrylonitrile-butadiene-styrene, oriented styrene film, polyester film, and other thermoplastics materials. The addition of the plastics to the paper, of course, adds extra rigidity to the laminate; the plastic also serves as the inside or outside surface of the finished product. Almost any type of design or color can be imprinted into the plastic film surface to eliminate the necessity for finishing.

Markets envisioned by the manufacturers include packaging, luggage, decorative boxes and food containers, toys, and various industrial parts. A typical laminate for a luggage application would involve sheets of 2-mil oriented styrene interspersed between layers *(To page 206)*



HOW ROYALITE SOLVES 3 BASIC DESIGN PROBLEMS:

TOUGHNESS * BEAUTY * ECONOMY



Leading truck and trailer makers choose damage-free Royalite refrigeration panels that are easy to keep kitchen-clean . . . maintain stable temperature . . . keep weight at a minimum . . . and reduce cooling costs.

Royalite, most versatile of thermoplastic sheet materials, has proven itself time and again to scores of manufacturers . . . in hundreds of varied applications. **Toughness:** Tote boxes of Royalite have built-in resistance to hard knocks. Seamless, easily cleaned, no sharp edges to snag or splinter, quiet, impervious to oils, grease and most chemicals, really lasts. **Beauty:** luggage of Royalite allows modern concepts in molded designs . . . lightweight, pleasing textures, wide range of built-in colors, impact, scuff, and dent resistant, easily cleaned, lasts longer in travel. **Economy:** picnic cooler with pure white Royalite liner provides a non-conductor material with built-in thermal breaker at no extra cost . . . seamless, easily cleaned, odorless, can't rust, deep drawn, modest equipment and labor costs, fabricating techniques permit use on popular priced items. Find out how you can benefit from U.S. Royalite. Let one of our plastics engineers call on you. There is no obligation. Write for information.

Tote boxes by United States Rubber, *Luggage* courtesy of Crown Luggage Co., *Picnic Cooler* courtesy of Coleman Co. Inc., *Refrigeration Panels* courtesy of Trailmobile, Inc.

US RUBBER **Royalite®** A.B.S. THERMOPLASTIC SHEET

US RUBBER **United States Rubber**

2684 North Pulaski Road, Chicago 39, Illinois

THE PLASTISCOPE

(From page 204)

of X-Crepe paper and a surfacing of grained acrylonitrile-butadiene-styrene sheeting, 12 mils thick. On the question of economics, the manufacturer states that a lamination of 1 ply X-Crepe and 4-mil oriented styrene, for example, would have the same rigidity as a 10-mil polystyrene sheet; however, it would cost less.

Teflon price reductions

Price reductions of 8 to 10% on all grades of Teflon TFE-fluorocarbon resins have been announced by Du Pont. Teflon 1, a granulation for compression molding and ram or screw extrusion is now $4.10 a lb. in truckload lots, in contrast to a previous price of $4.50. Drum lot quantities are now $4.50. Teflon 5, a special granulation used for production of shaved tape is now $4.35 and $4.75 in drum lots. Teflon 6, a granulation for compounding to use in extrusion or lead-press type extrusion is now $6.65 in truckloads, down 80¢ from its previous price. Teflon 7, for void free moldings is now $4.60 a lb. in truckloads and Teflon 30, an aqueous dispersion is $5.15, down 45¢ from previous cost. In the last 15 years Teflon has been reduced from a minimum of $18 to the present minimum of $4.10.

The price of Teflon FEP, a developmental product that may be either molded or extruded on conventional equipment remains unchanged. Construction on a new plant is under way and commercial quantities are expected late this year.

Makes nylon strip

Commercial production of oriented and non-oriented nylon strip has been announced by Reeves Brothers, Inc., New York, N. Y. Designated Reevestrip, the oriented material is used primarily as a component in the manufacture of power transmission and conveyor belts, while the non-oriented nylon strip finds use in gaskets, washers, bearing seals, etc.

Laminated with leather or rubber, nylon gives (To page 209)

HELPFUL BOOKLETS FREE!

URETHANE FOAMING RESIN. 12-page illustrated brochure and series of technical bulletins give catalysts, mold release agents and molding techniques for a urethane foaming resin. Applications include wall insulation, sandwich prefabrication, unit insulation in refrigeration equipment. Thiokol Chemical Corp.

PLASTIC EXTRUSIONS, 2-COLOR EXTRUDER. Catalog lists this company's lines of belting, bindings, pipes, etc. Gives prices. Also describes a new vertical extruder that adds contrasting stripes to insulated wire, tubing, etc., for decorative or identification purposes. Thermoplastic Processes, Inc.

LIFTING MACHINE. Illustrated data sheet describes a line of 750-lb.-capacity "Shoplifter" models for die handling work, stacking in narrow aisles, and the loading and unloading of trucks. Economy Engineering Co.

CUSTOM FABRICATION SERVICE. 4-page illustrated brochure describes this company's custom services for the precision fabrication of Plexiglas, acetate, vinylite, styrene, Teflon, phenolics, etc. Parts include discs, washers, terminal boards, etc. Comco Plastics, Inc., Div. of Commercial Plastics & Supply Co.

VACUUM FORMING MOLDS. 4-page illustrated brochure discusses advantages of this company's sprayed metal molds for drape, plug and vacuum forming, especially of transparent plastics. Brochure also discusses advantages and disadvantages of plaster and resin molds. Metalmold Forming Co.

Just turn to the Manufacturers' Literature page in this issue (pages 183, 184), circle the numbers corresponding to the booklets you want, fill in the reply postcard and mail. No postage needed.

We'll see that you get the literature you request promptly.

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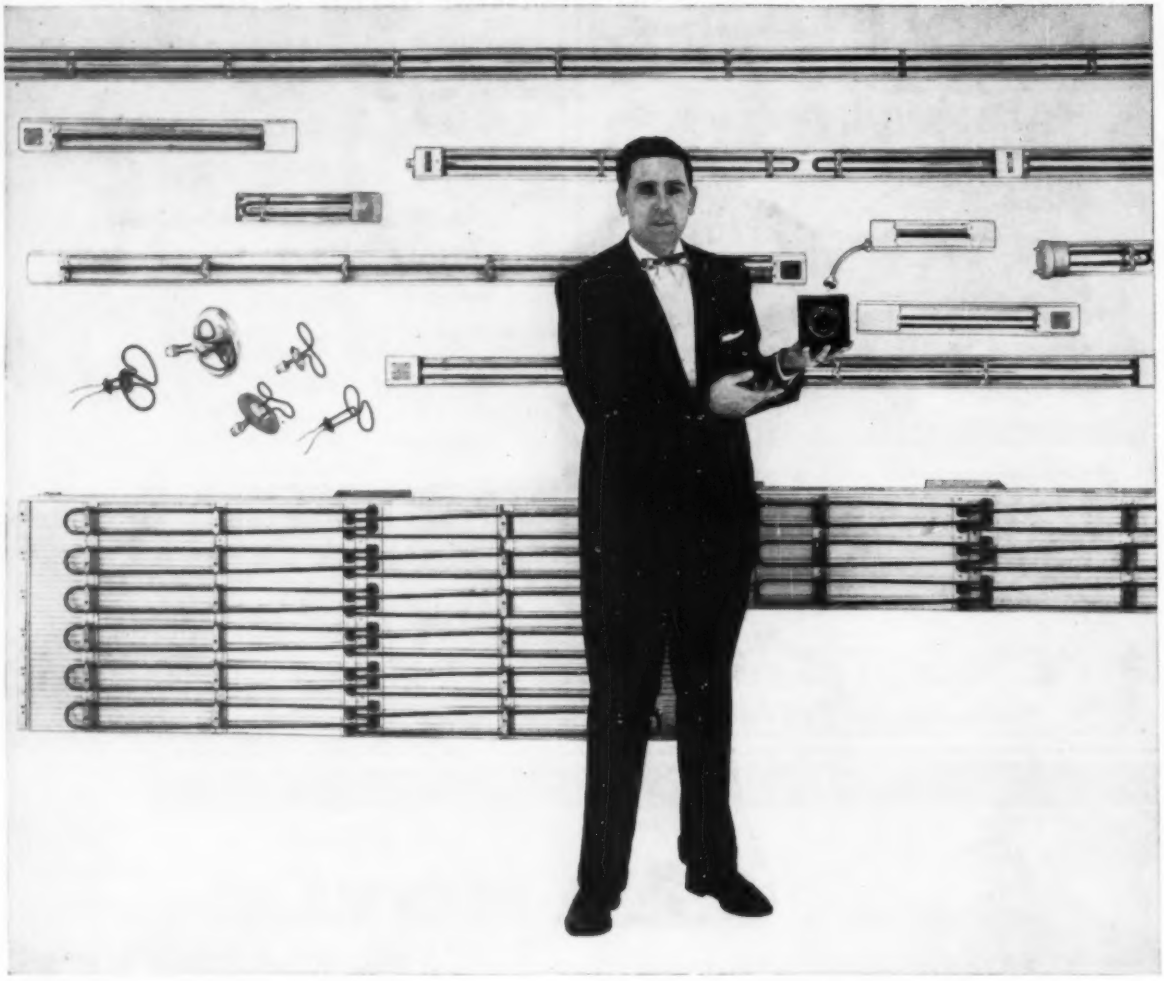
New heating problem? Old production headache?



Call the **CHROMALOX** *Man for the Answers*

At his fingertips, your Chromalox Representative has the answer to production delays, irregular product quality and other common problems caused by complex, outmoded heat sources. Chromalox Electric Far-Infrared radiation can be simply and precisely controlled over largest work areas, and is absorbed uniformly by practically all colors—even optically transparent materials.

With this fast, uniformly distributed heat, generated right at the job site, there is no need for stand-by heat or leaking lines. No smoke, fumes or flames. No glare. It's cooler and cleaner for your workers, too. Chromalox Far-Infrared elements are self-cleaning. Maintenance costs are minimum, as the all-metal heaters are practically indestructable —have no moving parts.

Get the best answers to all your heating problems. For assistance on new installations, or on improving an existing system, call or write your Chromalox Sales Engineering Representative. Standard heaters, to fit most jobs, are ready for immediate shipment from the world's largest stock. What's more, your Chromalox Representative offers factory design-engineering service for special applications. He has the electrical answer that's fast, clean, safe, accurate and economical.

4981

CHROMALOX
Electric Heat
INDUSTRIAL • COMMERCIAL • RESIDENTIAL
EDWIN L. WIEGAND COMPANY
7503 Thomas Boulevard • Pittsburgh 8, Pa.

THE PLASTISCOPE

(From page 206)

strength and flexibility, while the other materials provide the grip.

Reevestrip is available in thicknesses up to ⅛ in. and in widths up to 3 inches.

Decorations for laminates

Botanical items, butterflies, rice paper, and other decorative articles for laminations are supplied by Richoux Co., Inc., 1133 Broadway, New York 10, N. Y. The company also offers glitter made from various materials, including a new type of precision cut glitter made of copper base material.

New colorant

A highly pigmented paste dispersion utilizing a polyester resin vehicle which is free of styrene monomer has been introduced by Plastic Molders Supply Co., Inc., Fanwood, N. J. Called Scotch Master Paste, the colorant is said to be compatible with all resins, and is designed not to alter cure time. It has a shelf life of at least one year, according to a company spokesman.

Activated carbon available

A new, highly activated carbon, designated EKT-IV, is available from Henley & Co., 202 East 44th St., New York 17, N. Y. The material is said to be especially suited for application in processes where polymerization has to be prevented.

Due to the chemical activation process, EKT-IV contains traces of metal oxides finely dispersed in the carbon surface, which has proved of special advantage in catalytic applications, the company states. It is supplied in cylindrical form and does not need any special process technique.

Antioxidant offered

Tri-n-butyl phosphine (TBP), a strong organic base with good reducing properties and the ability to form coordination compounds, is offered in commercial quantities by the Chemicals & Plastics Div., Food Machinery & Chemical Corp.

According to the company, TBP shows promise as an epoxy resin curing catalyst, *(To page 210)*

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(From page 209)

in making vinyl and vinylidene esters, in polymerizing vinyl compounds and in controlling the polymerization of organic isocyanates and other reactions.

Mildew-proofing for PVC

A fungicidal and fungistatic additive for polyvinyl chloride compounds is offered by Ottawa Chemical Co., Toledo, Ohio. Designated Ottacide P, the material is said to inhibit fungus growth in semi-rigid and rigid PVC compounds, and in their copolymers. According to the company, tests indicate lasting mildew-proofing with no discoloration or loss of tensile strength.

The additive is compatible with the usual PVC plasticizers and stabilizers, and presents no compounding problems, whether in solution, fluxed compounds, or plastisols, the company states.

More uses for polypropylene

Unbreakable dinnerware molded from Hercules Powder Co.'s Profax polypropylene is being marketed by Rogers Plastic Corp., West Warren, Mass. The dinnerware is said to have permanent gloss and permanent colors, and will withstand temperatures up to 300° F.

Graduated cylinders molded from polypropylene for optimum high temperature service are manufactured in six sizes from 25 ml. to 1000 ml. by American Agile Corp., Maple Heights, Cleveland, Ohio.

Improved nylon film

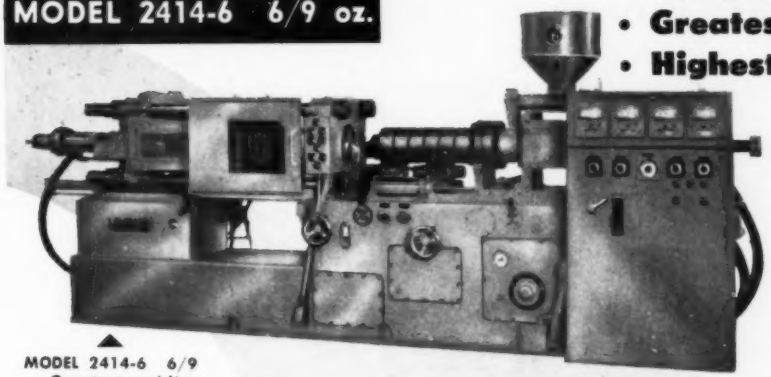
A new high-melt-viscosity nylon resin, called SN 607, is available from Spencer Chemical Co. The high melt viscosity is said to impart machine handling characteristics similar to polyethylene and will enable the extrusion of shapes and profiles which heretofore had to be injection molded or machined. Previous problems such as difficulty of extrusion and moisture absorption that caused wrinkling on the roll have reportedly been overcome. Two extruders are now producing film from 607, which it is said can be drawn down to *(To page 212)*

For all your molding requirements . . .

LOMBARD
Injection Molders

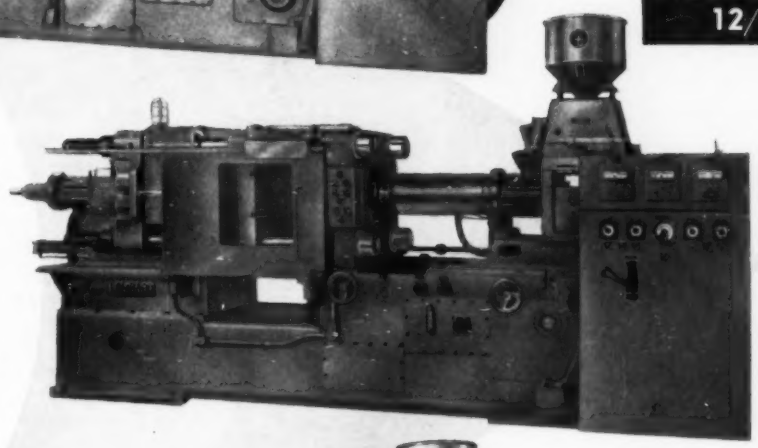
- **Complete Versatility**
- **Greatest Locking Pressure**
- **Highest Speeds**

MODEL 2414-6 6/9 oz.



MODEL 2414-6 6/9
Greatest molding machine development in years.

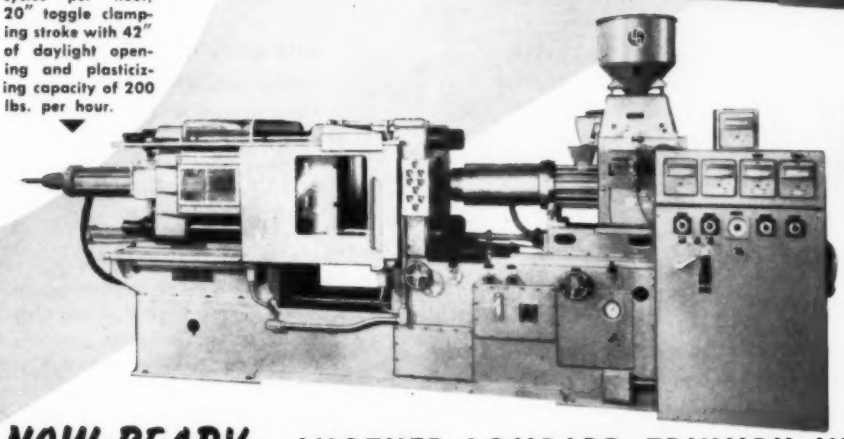
MODEL 3214-12 12/16 oz.



MODEL 3214-12 12/16
Die space (720 square inches), more daylight opening (42") and more plasticizing capacity (150 lbs. per hour) than any other 12 oz. press.

MODEL 3220-16 16/20
Compare these features — 420 dry cycles per hour, 20" toggle clamping stroke with 42" of daylight opening and plasticizing capacity of 200 lbs. per hour.

MODEL 3220-16 16/20 oz.



NOW READY — ANOTHER LOMBARD TRIUMPH IN ENGINEERING

THE NEW 3220-125 HIGH SPEED 12-16 OUNCE MODEL

SPECIFICATION SHEET AVAILABLE ON REQUEST

LOMBARD GOVERNOR CORPORATION Ashland, Massachusetts

THE PLASTISCOPE

(From page 210)

¼ mil and can be heat sealed. It will be used where greaseproofness, impermeability to gases and great strength are required.

Self-adhesive wall covering

Three-dimensional thermoformed vinyl wall covering that simulates brick, straw, bamboo, field stone or cypress wood, is now available with a self-adhesive backing from Comark Plastics Div., Cohn-Hall-Marx Co., a Div. of United Merchants & Mfrs., Inc., New York, N.Y. These new designs in the company's line of Con-Tact wall covering are available in interlocking panels, measuring 18 by 24½-in., and retailing at 99¢ a panel.

Plastics vials give protection

A line of amber vials made of Koppers' Dylene #4 polystyrene has been developed by the Glass & Closure Div., Armstrong Cork Co., to provide light-protective prescription containers. The vials are fitted with white opaque polyethylene snap caps, which give a tight seal, can be removed easily, and have flat tops for convenient marking.

In addition to better protection for the contents, the plastics vials also impart a quality appearance to the product, according to Armstrong.

Expansion

Haveg Industries, Inc., Pla-Tank Div., opened a plant at Warren, Mass., to make reinforced plastics tanks up to 12-ft. in diameter, by 60-ft. in length, and corrosion resistant duct work.

American Chemical Corp. is building a $7.5 million petrochemical plant at Watson, Calif., where vinyl chloride monomer and polymer, ethyl chloride and ethylene dichloride will be produced. Production is scheduled to begin in January, 1960. This is the first large-scale vinyl chloride plant on the west coast.

American is jointly owned by **Stauffer Chemical Co.** and **Richfield Oil Corp.** and the plant is adjacent to the latter's refinery where raw *(To page 214)*

In 1958 customers bought more BAKERS than any other make!

more . . .

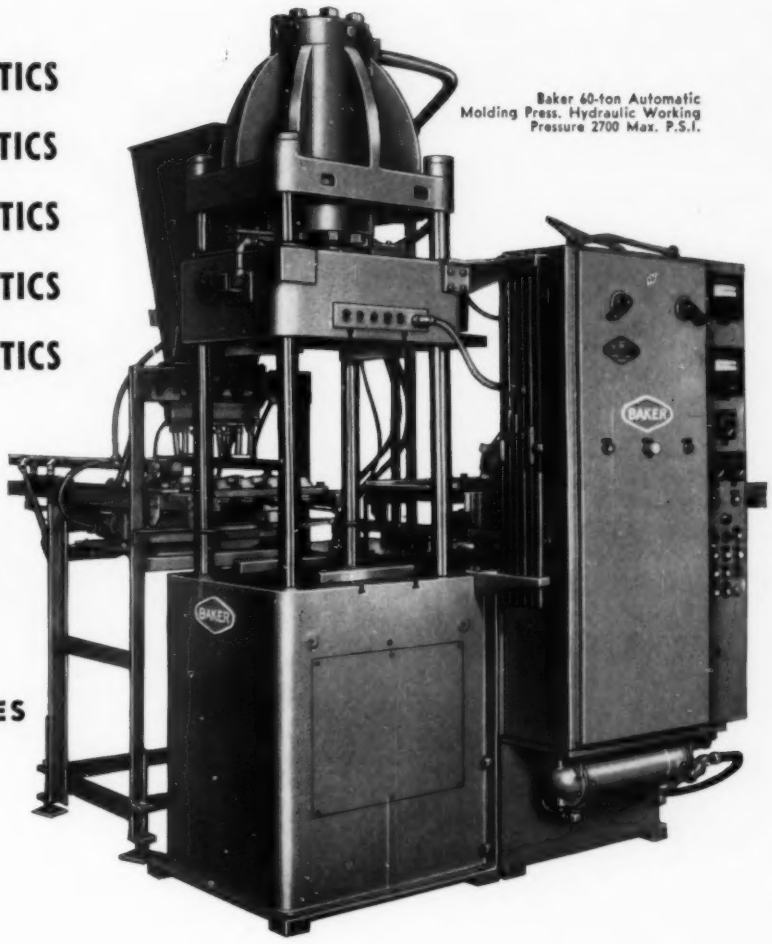
60-TON AUTOMATICS

75-TON AUTOMATICS

100-TON AUTOMATICS

150-TON AUTOMATICS

175-TON AUTOMATICS



Baker 60-ton Automatic Molding Press. Hydraulic Working Pressure 2700 Max. P.S.I.

BAKER

AUTOMATIC MOLDING MACHINES

In 60, 75, 100, 150, and 175-ton Automatics — Baker led in sales because these machines have what it takes to produce lower piece part prices. Independent upper and lower hydraulic ejection, an automatic safety reflex that stops press if a part fails to eject, time and length of all functions instantly adjustable — these are the reasons more companies are purchasing Bakers. For the full story, write Baker Brothers, Inc., Dept. OP-359, 1010 Post Street, Toledo 10, Ohio.

THE PLASTISCOPE

(From page 212)

materials will be available. **Hans Stauffer** is president; **Charles A. Lindsay,** now V.P. and gen. mgr. of Stauffer's Molded Products Div., will hold the same position in the new firm. **A. P. McGuire** has been named plant manager.

Standard Oil Co. (Ohio) will build a new plant at Lima, Ohio, for the manufacture of acrylonitrile based on a process developed in the Sohio Research Center in Cleveland, Ohio. Raw materials are available from a refinery and ammonia plant near the new site.

American Cyanamid Co. has announced that the new development laboratory of the Plastics & Resins Div., and a pilot plant at Wallingford, Conn., are now in full operation. Both structures adjoin the company's present plastics production facilities.

Certain process and product development work, previously carried out at the company's Stamford, Conn. laboratories, the Bound Brook, N. J. plant, and at Wallingford, have been consolidated in the new facilities.

Carlon Products Corp., an affiliate of **American Research & Development Corp.,** Aurora, Ohio, has purchased the assets of the **United Pipe & Tube Co.,** Lubbock, Texas. The facilities will be operated under the Carlon name, and will supply the company's line of plastic pipe and fittings, and will also produce plastic-coated-steel pipe for underground applications.

Harold Mewhinney was named plant manager of the new facilities as well as of the Corsicana, east Texas plant.

According to **William L. Abramowitz,** Carlon president, 1958 sales and earnings have been the highest in the history of the firm.

Tennessee Eastman Co., manufacturing division of **Eastman Kodak Co.,** is adding 5000-sq. ft. to its plastics development laboratory at Kingsport, Tenn. New equipment installed includes an overwrap machine to handle up to 100 boxes per minute in polyethylene film, and a laminating machine that applies a polyethylene film down to ⅛ mil on paper or other materials at speeds up to 900 lineal ft. per minute. The laboratory also has a new machine that can coat 12- through 25-gage wire at up to 300 ft. per minute.

B. F. Goodrich Chemical Co., a division of the **B. F. Goodrich Co.,** has installed a fully automated vinyl chloride monomer production unit at its Calvert City, Ky., plant. It is said to be the first in the chemical processing field to utilize a digital system to operate a chemical process specifically designed for computer control.

E. I. du Pont de Nemours & Co., Inc. has opened a new research center for the Electrochemicals Dept., adjacent to the company's manufacturing plant at Niagara Falls, N. Y. The 44,000-sq. ft. building is occupied by about 100 persons, who will be engaged in research and *(To page 216)*

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(From page 214)

development work on vinyl products, nylon intermediates, sodium, peroxygen compounds, etc.

Nopco Chemical Co., Plastics Div., has broken ground for construction at North Arlington, N. J., that will triple the size of the present plant, provide six times the present capacity for making urethane flexible foams, and permit expanding facilities for foamed-in-place systems. Completion of the facility is tentatively scheduled for July, 1959.

Hercules Powder Co. and **Stauffer Chemical Co.** will jointly form a new company to manufacture aluminum trialkyls and other aluminum alkyls by a process discovered and patented by Prof. Ziegler. These compounds are useful as intermediates in the preparation of various polymerization catalysts, and can also be used in the manufacture of straight-chain alcohols and olefins.

The new company, as yet unnamed, will have a yearly capacity in excess of 1 million pounds initially, the output of the new plant will be sold by Stauffer's **Anderson Chemical Co. Div.**

Nosco Plastics, Inc., Erie, Pa., custom molder, has been acquired by **Holgate Bros. Co.,** Kane, Pa., wood working firm and toy manufacturer. **Robert C. Houser** was named president, and **James C. Leslie** chairman.

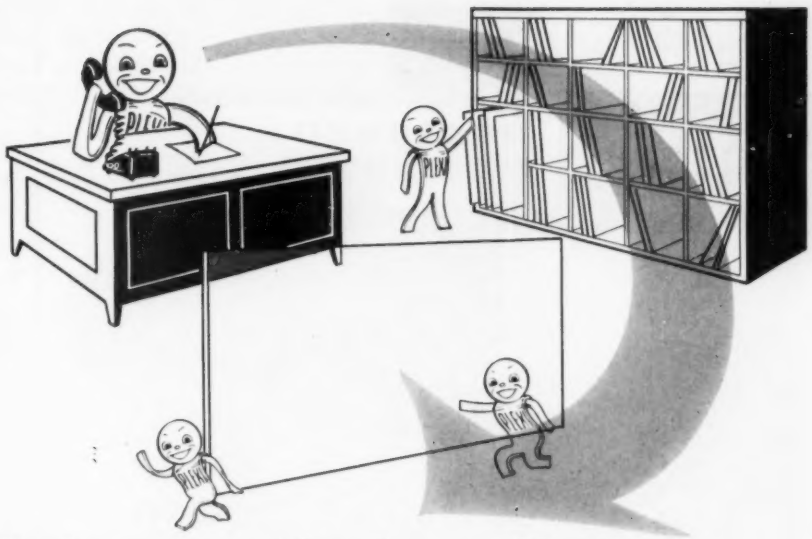
The operating management remains virtually unchanged, with **Paul C. Roche** as VP and general manager, **Harold C. Cloyd** as VP and chief development engineer. **Reuben G. Kugel,** former Nosco president remains as a VP and consultant.

Nosco, formerly the National Organ Supply Co., entered the injection molding business in 1936, and currently employs more than 200 persons in its 227,000-sq. ft. plant.

E. V. Roberts & Associates, Inc. has moved its Chemical Materials Div. to 8962 National Blvd., Los Angeles, Calif. *(To page 218)*

AUTHORIZED PLEXIGLAS DEALERS
are located in these cities:

Atlanta, Georgia
Baltimore, Maryland
Boston, Massachusetts
Bridgeport, Connecticut
Buffalo, New York
Charlotte, North Carolina
Chicago, Illinois
Cincinnati, Ohio
Cleveland, Ohio
Dallas, Texas
Dayton, Ohio
Denver, Colorado
Detroit, Michigan
Fort Worth, Texas
Grand Prairie, Texas
Hanover, Pennsylvania
Hartford, Connecticut
Houston, Texas
Indianapolis, Indiana
Kansas City, Missouri
Los Angeles, California
Louisville, Kentucky
Memphis, Tennessee
Miami, Florida
Milwaukee, Wisconsin
Minneapolis, Minnesota
New York, New York
Newark, New Jersey
Philadelphia, Pennsylvania
Phoenix, Arizona
Pittsburgh, Pennsylvania
Richmond, Virginia
Rochester, New York
Salt Lake City, Utah
San Antonio, Texas
San Diego, California
San Francisco, California
Seattle, Washington
St. Louis, Missouri
St. Paul, Minnesota
Syracuse, New York
Tampa, Florida
Washington, D. C.
Wilmington, Delaware



Best source of Service on Plastics . . .

AUTHORIZED PLEXIGLAS DEALERS

It pays to call an Authorized PLEXIGLAS® Dealer when you need plastics. Why? He provides complete service on PLEXIGLAS acrylic plastic, other plastics and a wide range of accessory products. He gives prompt delivery, and is qualified to help you with fabrication and technical information. And your Authorized Dealer has a stock that includes almost any size and thickness of PLEXIGLAS—clear and colored sheets . . . patterned, corrugated and extruded sheets. He is listed under PLEXIGLAS in the Plastics section of telephone directories in major cities.

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

In Canada: *Rohm & Haas Co. of Canada, Ltd., West Hill / Crystal Glass & Plastics, Ltd., Toronto*

THE PLASTISCOPE

(From page 216)

This increases warehouse space four-fold and provides larger facilities for re-packaging plastics materials and chemicals for distribution.

Mobay Chemical Co. plans a 50% increase in tolylene diisocyanate (TDI) capacity at its New Martinsville, W. Va. plant. This follows a 50% expansion completed in the fall of 1958, and increases its TDI facilities to 18 million lb. a year. Completion is scheduled for early 1960.

TDI is one of the basic chemicals used in the manufacture of urethane. According to Mobay present installed capacity for this chemical in the United States is 45 million lb. a year.

American Enka Corp., a leading producer of rayon, has purchased **William Brand & Co., Inc.**, Willimantic, Conn., manufacturer of plastics insulated wire and cable. The present management will continue to operate the plants, and **William Brand,** founder and chairman of the board of the family-owned concern, will remain active in the company.

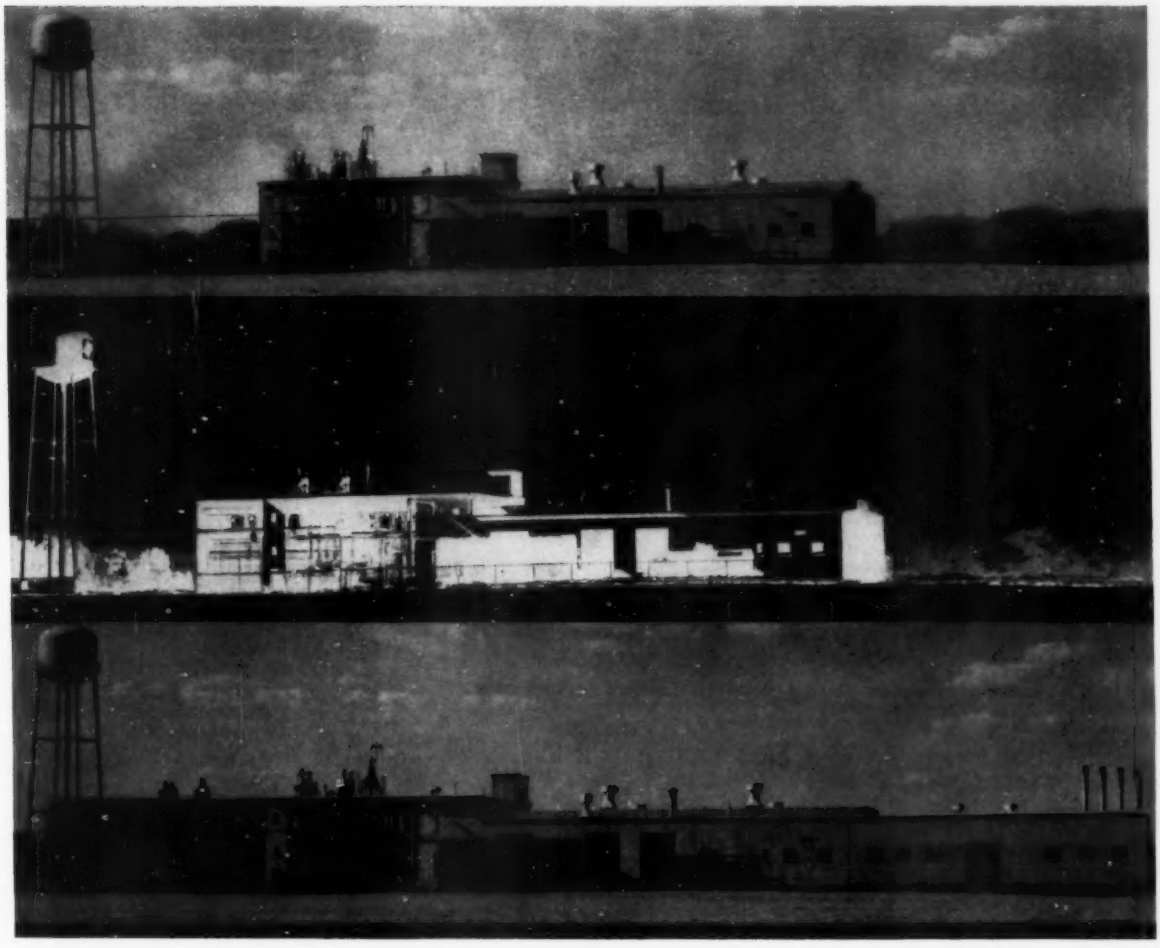
Continental-Diamond Fibre Corp., a subsidiary of **The Budd Co.**, is constructing a $350,000 research center at its Newark, Del., headquarters plant. Completion is scheduled for August, 1959.

Newark Paraffine Paper Co., Newark, N. J., has purchased a rotogravure press, and two flexographic presses for printing waxed wrappers, plastics films, and multiple laminations of foil, paper, and films.

William M. Fiore, Inc. has opened a new 8000-sq. ft. plant in Brooklyn, N. Y., to provide spraying, stamping, screening, assembly, and other related operations for advertising displays, name plates, decorative trim, novelties, and similar applications.

Cepco Plastics Co. has begun full-scale molding operations in its recently completed building at 1173 Reco, *(To page 220)*

Blaw-Knox built them all—starting with National Starch's original plant, and continuing with the design and construction of two successive expansions. Responsibility included all buildings, process equipment and utilities.



at Meredosia, Illinois

National Starch increases polyvinyl acetate production 200% in three years

In 1955 a new plant . . . by spring of '56 an expansion that doubled capacity . . . today a second expansion that will again double original capacity.

In all of this dynamic growth National Starch and Blaw-Knox have been building together. From the first, owner and contractor formed a smooth working team as they erected the original plant. This same team was put to work again and again as National Starch retained Blaw-Knox to design and build two plant expansions.

It is the winning combination of men solving problem after problem that has kept all the projects moving ahead on schedule.

To learn how Blaw-Knox's broad experience and technical resources can help you with a process, a new facility, or plant modernization or expansion, contact Blaw-Knox Company with headquarters in Pittsburgh, branch offices in New York, Chicago, Haddon Heights, New Jersey, Birmingham, Washington, D.C. and San Francisco.

plant builders for industry . . . BLAW-KNOX

THE PLASTISCOPE

(From page 218)

St. Louis, Mo. The company has installed about $130,000 worth of injection molding machinery.

Reichhold Chemicals, Inc. has started construction on a new $5 million phthalic anhydride plant at Elizabeth, N. J. Scheduled for completion late in 1959, the plant will have a capacity of 30-million lb. annually.

Morningstar - Paisley, Inc. has started production of liquid vinyl chloride formulations at its new Clifton, N. J., plant. This facility provides 100,000-sq. ft. of manufacturing space, and will produce the bulk of the company's plastisol, organosol, and latex products. The vinyl formulations are used for dipping, rotational and slush molding techniques as well as spray, roller and knife-coating. The trade name is Morpasol. Production of vinyl acetate emulsions for adhesives will begin later this spring.

Ryko Products, Inc. is adding 5,000 sq. ft. of manufacturing area to its existing extrusion and fabricating facilities at 814-24 San Fernando Rd., Los Angeles 65, Calif. The company specializes in polystyrene and acrylic.

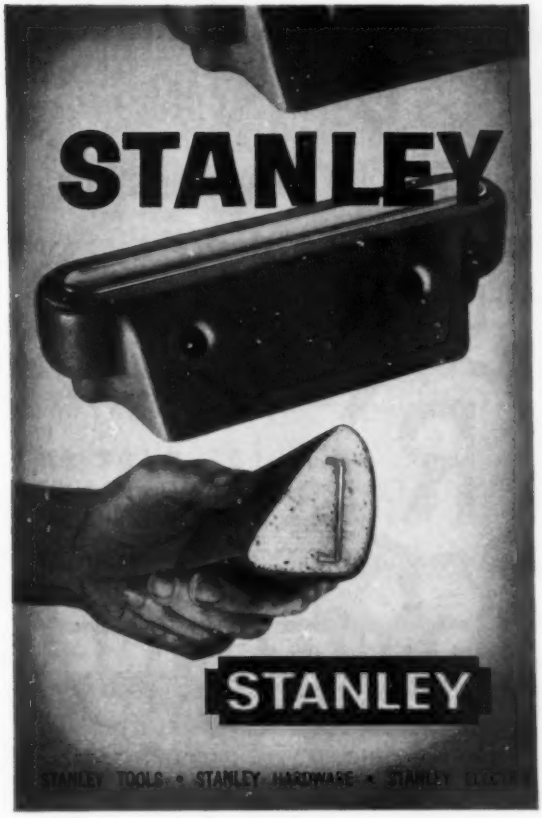
National Starch Products, Inc. has announced a 50% expansion of its vinyl acetate polymerization plant in Meredosia, Ill.

M. C. Gill Corp., plastics laminators, South El Monte, Calif., has started construction of facilities to enter the field of metal honeycomb construction for the aviation and missile industries.

Deceased

John M. Taylor, Sr., 67, founder and past chairman of the board of **Taylor Fibre Co.**, Norristown, Pa., died January 13. He was a pioneer in the manufacture of laminated plastics, and in the manufacture of vulcanized fibre by continuous production methods.

E. E. Smith, 45, sales manager and asst. secretary of **Synthane Corp.**, died Jan. 27. He *(To page 224)*



Here's how PITTSBURGH FIBER GLASS can help you make better laminated and molded products

1... through top-quality uniformity

Pittsburgh Fiber Glass, produced by the direct melt process under close control, is a top-quality, uniform reinforcement with exceptional strength, dimensional stability and dielectric strength . . . that is fire resistant, heat resistant and odorless.

2... with the right reinforcement for your needs

YARNS—supplied to weavers in any twist or ply in all standard sizes. Reliable uniformity of Pittsburgh Yarns has won its acceptance for use in cloth laminates for military applications.

ROVING—available in a variety of finishes and end counts. Custom wound for your requirements. Static-free Pittsburgh Roving makes pre-form operations easier and faster, produces better quality end products.

CHOPPED STRAND—supplied in lengths ¼" and up. Packaged for convenient handling. High uniform quality reduces percentage of rejects.

3... and technical assistance

You can arrange to have free trials made right in your own plant to show you how Pittsburgh Fiber Glass can help you produce better products. Write or call your nearest Pittsburgh Plate Glass sales office or our main office in Pittsburgh.

Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pa.

PITTSBURGH FIBER GLASS IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh and St. Louis

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PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS

PITTSBURGH PLATE GLASS COMPANY

THE PLASTISCOPE

(From page 220)

joined the company in 1940 and became sales manager in 1952.

R. W. Dailey, Metropolitan New York representative of **Amos Molded Plastics,** Div. of **Amos-Thompson Corp.,** Edinburg, Ind., died Dec. 6, 1958 after a prolonged liver ailment. He designed and developed many of the company's molded plastic items.

Meetings

Plastics groups

March 26, 27: The Society of the Plastics Industry, Inc., 16th Pacific Coast Section Conference, Hotel Del Coronado, Coronado, Calif.

April 1: Society of Plastics Engineers, Inc., Western New England Section Conference, Bradley Field, Terrace Dining Room, Windsor Locks, Conn. Topic: "The Use of an Extruder for Non-Continuous Operations."

April 20, 21: The Society of the Plastics Industry (Canada), Inc., 17th Annual SPI Canadian Section Conference, Windsor Hotel, Montreal, Canada.

Other meetings

April 3: Akron Polymer Lecture Group, Room 107, Knight Hall, University of Akron, Akron, Ohio. Subject: "Viton Fluorocarbon Elastomers."

April 13-17: American Management Association, AMA 28th National Packaging Exposition, International Amphitheatre, Chicago, Ill. Accompanying it will be the AMA National Packaging Conference at the Palmer House, April 13-15.

April 18-22: American Society of Tool Engineers, ASTE Annual Meeting, Schroeder Hotel, Milwaukee, Wis.

April 29, 30: Manufacturing Chemists' Association, Engineering and Scientific Center, Cleveland, Ohio. Symposium on packaging and transportation of chemical products.—END

ALLADIN BUYS 5 NATCOS
(12 to 80 oz.)

Alladin picks Natcos to mold housewares because . . .

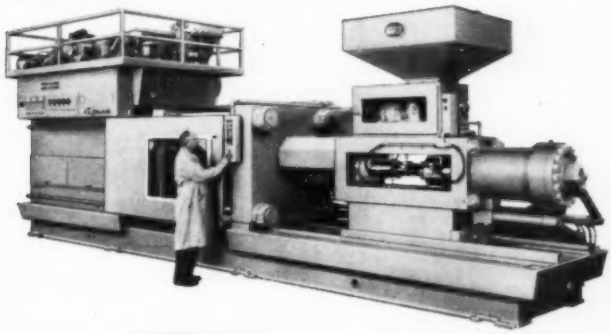
NATCOS ARE FAST

Fast action means more parts per hour for Alladin Plastics, Inc., Gardena, California. Closing speeds on Natco's injection molding machines are fast! Full pressure build-up in a fraction of a second with no mold slam or shock.

The Natco design includes every possible control over pressures, temperatures, and speeds to give the molder the most ideal and fastest cycle available for his molded parts.

NATCOS ARE DEPENDABLE

Natco's shockless closed-circuit hydraulic system assures Alladin of trouble-free operation. This patented system obsoletes traditional open-circuit systems with their hydraulic shock and resulting broken pipes, fractured fittings, oil leaks, and other failures. The Natco closed circuit system uses a reversing type pump. Ram reversals are made by directly reversing the output of the pump rather than employing piston-type operating valves. Line pressure is zero at the point of ram reversal; therefore, no shock! Pump shift takes only a fraction of a second. And the entire hydraulic unit is overhead, away from molding room traffic!



Typical of Natco 800 production at Alladin Plastics, Inc., is the molding of this 29 ounce wastebasket every 24 seconds.

Natco Model 300, 400, and 800 injection molding machines—with capacities running from 12 to 80 ounces—will be used by Alladin. Many outstanding features make the Natco a molder's favorite.

For example—the big, versatile 80 oz. machine gives you: Choice of clamp stroke—40" or 55"! Choice of power unit—82½ or 157½ hp! High speed injection—a full shot in just 3 seconds! The Natco 800 offers these features that mean more profit to the molder: shockless hydraulics for trouble-free operation—two-speed injection—fastest clamp action—interchangeable 20,000 and 30,000 psi plungers—many more.

Natcos are available in stock sizes from 12 to 80 oz. Write for Bulletin 2001-MP.

NATCO

PLASTICS MACHINERY DIVISION
NATIONAL AUTOMATIC TOOL COMPANY, INC.
RICHMOND, INDIANA

COMPANIES...PEOPLE

Appointments, promotions, and relocations in the plastics industry.

The Dow Chemical Co.: Dr. W. C. Goggin, previously mgr.—plastics techn. service, named mgr.—plastics dept. He succeeds **C. B. Branch,** who

W. C. Goggin

C. B. Branch

is now mgr. of the company's overseas and foreign activities outside the North American continent.

The Dobeckmum Co., div. of Dow Chemical Co., moved its New York dist. office from 350 Fifth Ave. to 45 Rockefeller Center. **W. C. Dougan** named dist. mgr., succeeding **J. C. Jorgensen,** who will remain as a company consultant.

Union Carbide Corp.—Union Carbide Plastics Co.: Edward R. Young appointed product market mgr.

Union Carbide Chemicals Co.: Victor H. Boden named mgr.—product marketing. He heads the following group of product sales mgrs.: **Robert C. Boltz**—plasticizers, monomers, and higher alcohols; **Howard L. Harwell**—glycols, amines, oxides, and Niax polyols; **Robert B. Leonard**—ester and ketone solvents, lower alcohols, and ethers; **Frederick J. Rauscher**—acids, anhydrides, aldehydes, chlorinated compounds, and glycol-ethers; **John M. Russ**—Ucon functional fluids and lubricants.

Bruce A. Gustin, Jr. promoted from dist. mgr.—Boston to Eastern Div. mgr. He is succeeded by **James R. Retter. George S. Cooper, Jr.** named asst. dist. mgr.—New York, and **Theodore J. Hamilton** now dist. mgr.—Albany, N. Y.

Lester D. Berger, Jr. appointed asst. mgr.—New Chemicals, responsible for water-soluble chemicals and surface-active agents. **Sebern G. Sellers** and **Eugene P. Fisler, Jr.** named product mgrs.

Bakelite Ltd., England: Howard V. Potter retired as chrmn. He is succeeded by **Stanley Adams,** vice-chrmn. since 1948. Mr. Potter is pres. of the British Plastics Federation.

National Vulcanized Fibre Co., Wilmington, Del., plans to acquire **Parsons Paper Co.,** Holyoke, Mass., which will become the **Parsons Paper Div.** of National. No changes in personnel, products, or sales policies are contemplated.

Tech-Art Plastics Co., Morristown, N. J.: **W. C. Rodgers** appointed plant mgr. **William J. Woodruff** named sales mgr. **J. Harry DuBois** is management and engineering consultant.

Insulating Fabricators Co., E. Rutherford, N. J., and **Insulating Fabricators of New England,** Watertown, Mass., will handle all sales for Tech-Art.

Shell Chemical Corp., Plastics & Resins Div.: W. C. Lowrey named marketing mgr. **F. M. McMillan** is mgr.—R & D, and **D. B. Luckenbill** appointed mgr.—operations.

D. P. Jones named sales mgr., and **J. G. Dickerson** is sales development mgr. **D. F. Bradley,** Cleveland; **J. R. Brady, Jr.,** Chicago; **G. F. Metzinger,** Los Angeles; and **D. M. Neely,** New York, named dist. mgrs.

Shell Development Co.: Dr. C. W. Smith appointed head of the organic chemistry dept. at the Emeryville, Calif., research center.

U. S. Industrial Chemicals Co., Div. of National Distillers & Chemical Corp.: Ralph M. Knight named mgr.—polyolefin planning and applications, which includes directing the company's polymer service laboratories at Tuscola, Ill.

R. M. Knight

T. Howard Dantzler named supt. of operations; **E. P. Richards** made chief engineer; and **Eugene C. Carlson** appointed techn. supt.; at the company's Houston, Texas polyethylene plant.

Society of Plastics Engineers, Inc. The following were elected national officers for the current year: **Fred C. Sutro, Jr., Spencer Chemical Co.**—national pres.; **George W. Martin, Holyoke Plastics Corp.**—1st VP; **Jules W. Lindau III, Southern Plastics, Inc.**—2nd VP; **Frank W. Reynolds, IBM Corp.,**—secy., **Haiman S. Nathan, Atlas Plastics, Inc.,**—treas.

F. Sutro, Jr.

JaRo Chem, 2551 Farrington St., Dallas, Texas, appointed sales reps. for **Colton Chemical Co.,** div. of **Air Reduction Co., Inc.**

Colonial Supply Co., 217 Water St., Pittsburgh, Pa., appointed a distributor of PVC pipe manufactured by **A. M. Byers Co.,** Pittsburgh, Pa.

The Garlock Packing Co., Palmyra, N. Y.: **Robert M. Waples,** formerly pres., named chrmn., succeeding **George L. Abbott** who retired. **A. J. McMullen** named pres. and chief exec. and admin. officer.

American Cyanamid Co.—Plastics & Resins Div.: E. K. Hunt promoted from sales mgr. to newly-created

E. K. Hunt

H. C. Milton

post of merchandising mgr. He is succeeded by **H. C. Milton,** previously public relations mgr. of Cyanamid.

Formica Corp.: Walter A. Smith, formerly asst. to the pres., named VP and asst. gen. mgr. **Kenneth A. Arata** and **John C. Pitzer** named mgrs.—process engineering for decorative laminated plastics, and industrial Formica products, respectively.

New dist. offices in Richmond, Va., and Portland, Ore., are headed by **James A. Smith** and **Robert N. Power,** respectively.

Commercial Plastics & Supply Corp., New York, N. Y., and **Comco Plastics, Inc.,** Ozone Park, N. Y., named independent fabricators of Formica industrial plastics laminates.

Organic Chemicals Div.: Dr. J. H. Paden appointed dir. of research, with headquarters at Bound **Brook,** N. J.

Southern California Plastics Fabricators Assn.: Robert Emley elected pres. **Wallace Junek** is VP. The assn. is composed of fabricators, mfrs., and suppliers of plastics laminates and allied products.

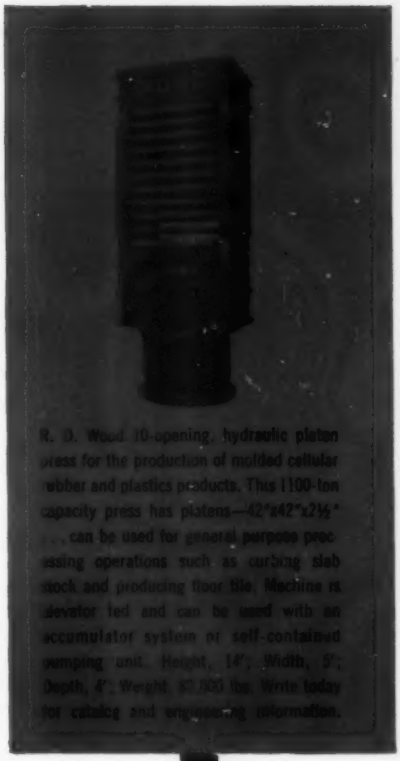
Shore Line Industries, Inc., Clinton, Conn.: **John C. Wagner, Jr.** named exec. VP and gen. mgr. **John J. Rapp** heads prod., and **George Anderheggen** is sales mgr. The company extrudes, prints and converts polyethylene film.

Product Techniques, Inc., Hudson, Ohio, named sales reps. to the plastics industry for Silvacel wood fiber and Silvacon bark derivative products manufactured by the **Silvatek Products Div., Weyerhaeuser Timber Co.**

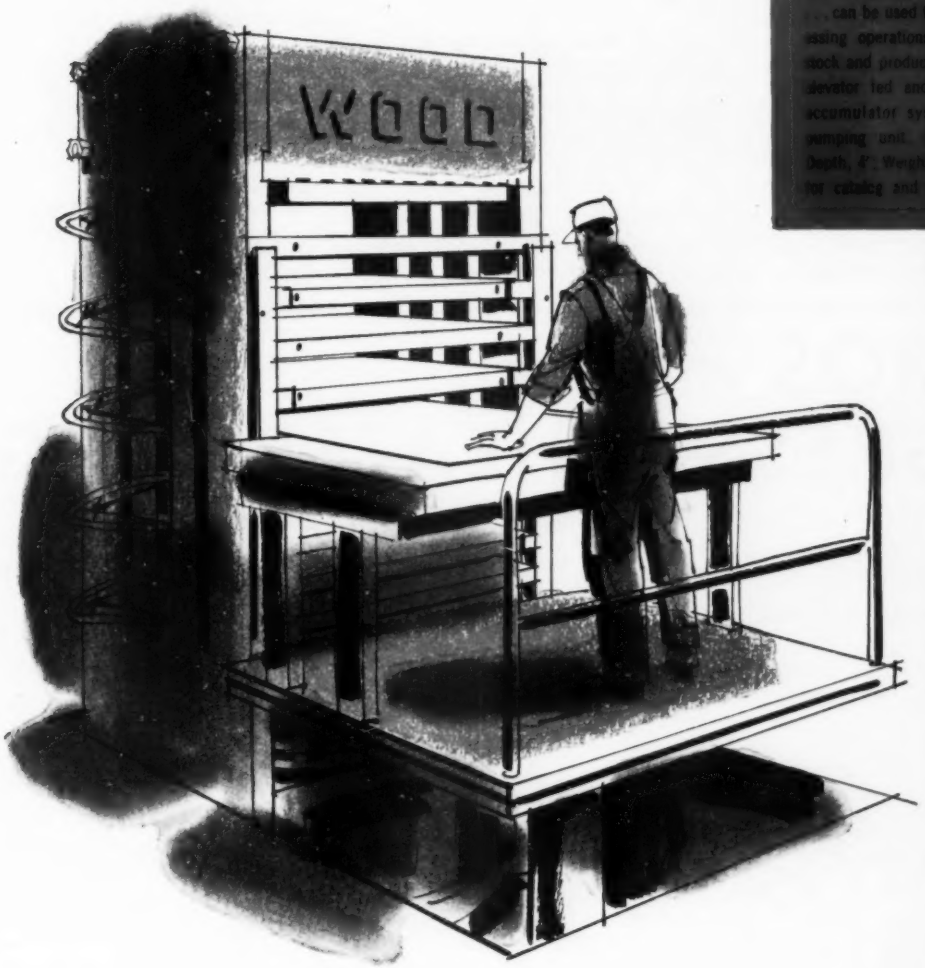
Dennis Chemical Co., St. Louis, Mo.: **Sidney Dennis** elected pres., **Frank Gollub** named VP—R & D. **Milton Carlie** appointed sales mgr., and **Marvin Wool** is chief chemist. The company is a producer of vinyl plastisols and industrial finishes, as well as adhesives. *(To page 228)*

Apply your special requirements to basic R. D. Wood press designs

Here's the sensible, economical way to design your own press. Working with numerous *basic* models, R. D. Wood engineers apply *your* specifications and modifications to produce the press precisely suited to your needs. No starting from scratch. No needless delays in construction. No paying for more design than you need. You're sure of quality too. For every Wood press is constructed of selected materials by master craftsmen. Here is your assurance of precise operation and long, trouble-free performance. When you need a press, bring your specifications to Wood.



R. D. Wood 10-opening, hydraulic platen press for the production of molded cellular rubber and plastics products. This 1100-ton capacity press has platens—42"x42"x2½" . . . can be used for general purpose processing operations such as curbing slab stock and producing floor tile. Machine is elevator fed and can be used with an accumulator system or self-contained pumping unit. Height, 14'; Width, 5'; Depth, 4'; Weight, 82,000 lbs. Write today for catalog and engineering information.



R. D. WOOD COMPANY

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA

COMPANIES...PEOPLE

(From page 226)

Vinyl Fabrics Institute: Jules D. Lippmann, Textileather Div., General Tire & Rubber Co., elected pres. **C. Gordon Jelliffe, Columbus Coated Fabrics, Corp.,** and **Paul Howard, Weymouth Art Leather Corp.,** elected 1st and 2nd VP, respectively.

Hercules Powder Co., Cellulose Products Dept.: George M. Taylor, formerly plastics sales rep. in Detroit, Mich., to head sales of Penton, the company's new chlorinated polyether plastic.

The following were named plastics reps.: **Daniel G. Welsh**—Wilmington, Del.; **Paul Metzger**—Los Angeles, Calif.; **John D. Cochrane III**—Detroit; **John Y. Lomax**—New York.

J. Walter Guyer, formerly dir. of development, Ren Plastics, now VP and dir. of research, **Conap, Inc.,** Olean, N. Y., a research and development organization.

Walter W. Heironimus, formerly with Rohm & Haas Co., has joined the sales organization of **Universal Plastics Co.,** Seattle, Wash.

Donald S. Kendall, co-founder and former treas. of **Mack Molding Co.,** named pres. of the firm, succeeding **Kenneth W. Macksey,** who died recently. Mr. Kendall will make his headquarters at Arlington, Vt.

Dr. R. J. Schatz appointed dir. of research for **Monsanto Chemical Co.'s** Plastics Div., Springfield, Mass.

Raymond H. Perkins named West Coast mgr. of **Farrel-Birmingham Co., Inc.,** with offices at 2032 Santa Fe Ave., Los Angeles 21, Calif. He succeeds **Paul R. Oliver,** who retired.

James V. Dunleavy, Jr. appointed VP—marketing, and national sales mgr. of **Gerber Plastic Co.** and its subsidiary, **Peer Plastic Co.,** with headquarters at 200 Fifth Ave., New York, N. Y.

Norman J. Harris named sales mgr., **Archer-Daniels-Midland Co.'s** plastics dept.

Thomas B. Nantz, formerly gen. mgr. of plants, named VP—mfg., **B. F. Goodrich Chemical Co.** He succeeds **Robert D. Scott,** recently appointed VP—development.

Louis H. Bachner has retired as an officer and dir. of **Chicago Molded Products Corp.**

James E. Renson appointed dir. of market research, **Interchemical Corp.** He succeeds **John Duane,** who resigned to become an independent consultant.

Archie C. Anderson named tech. dir. of the **A. O. Smith Corp.'s** new Reinforced Plastics Div., Milwaukee, Wis.

Charles F. Pfeifer appointed VP in charge of the **Panta-Pak Div., The Pantasote Co.,** Passaic, N. J., and New York, N. Y.

Alex Zakarian named national sales mgr. of **Filon Plastics Corp.,** El Segundo, Calif.

Richard E. Gromacki appointed product mgr.—market development dept., Research Div., **Wyandotte Chemicals Corp.**

Eric H. Rich appointed export sales mgr. of **Gering Products, Inc.,** succeeding **James D. Oakley,** who retired.

C. R. Knouse, formerly with the Crane Co., named sales mgr. of **Skyline Industries,** mfrs. of plastic pipes and fittings.—END

Correction

"Plastics Products." (MPL, Feb. 1959, p. 108): Supplier of polypropylene for drinking cup (Item #3) is Hercules Powder Co.

CLASSIFIED ADVERTISEMENTS

EMPLOYMENT • BUSINESS OPPORTUNITIES • USED OR RESALE EQUIPMENT

Machinery and Equipment for sale

SPECIAL: Large bed presses, two Alliance 400 ton, with 36" x 84" platen, complete with pullbacks. Stokes Model R4 Tablet Press complete with vari-drive. 16 oz. HPM injection molding machine complete with Wheelcos. Ball & Jewell Scrap Cutter—Midget, Ideal and larger sizes. Also, complete line of rubber and plastic processing equipment. Send for our listings. Johnson Machinery Co., 683 Frelinghuysen Ave., Newark 12, N.J., BL 8-2500.

FOR SALE: One 12 oz. DeMattia, 1957 Model, with 16 oz. heating cylinder. Can be seen in operation. Practically new—Excellent condition. Phone HUmboldt 4-1700, Newark, N. J.

FOR SALE: Mold & Hob Engraving Equipment—1 large and 1 small automatic & mechanical engraving machines. Reductions up to 10 to 1. Engrave left & right. 1 Dichel type 2 and 3 dimensional engraver with Gorton 8D- Duplicator. Inspection by appointment only. Allied Engravers, Inc., 552 W. Broadway, N.Y. 12, N.Y.

JUST SECURED—Most Modern Packaging and Processing Machinery—Available at Great Savings. Hayssen Model F Compaks with net weight scales, bulk and dribble feeds, Electric Eyes. Ceco Model 40-9½-GG Automatic Adjustable Cartoning Units. Also Model TT. Package Machinery, Hayssen, Scandia, Wrap King, Miller Wrappers. Pneumatic Scale Automatic Carton Feeder, Bottom Sealer, Wax Liner, Top Sealer with interconnecting Conveyors. Pneumatic Scale Tite Wrap. Fitzpatrick Model D-6 Stainless Steel Comminuters. Day, Robinson 50 to 10,000 lb. Dry Powder Mixers. Werner & Pfleiderer 3,000 gal. and 3,500 gal. Jacketed Double Arm Mixers. Baker Perkins, from 2 to 100 gal., Double Arm Mixers. Jacketed and Stainless Steel. Stokes DD2 and Eureka Tablet Machines. Complete Details and Quotations Promptly Submitted. Union Standard Equipment Co., 318-322 Lafayette St., N.Y. 12, N.Y. Phone: CAnal 6-5334.

FOR SALE—1—18" x 50"—2 roll Thropp plastics mill, M. D.; 3 compression molding presses 200, 150, 50 tons; 1 Defiance #20 preform machine, M. D.; 1—100 cu ft jacketed steel ribbon blender; 3 Cumberland 0, #½ granulators; also extruders, presses, cutters, etc. Chemical & Process Machinery Corp., 52 9th St., Brooklyn 15, N.Y., HY 9-7200.

FOR SALE: World's Largest Stock of Double Arm Mixers—43—Baker-Perkins #17, 200 gal. jacketed sigma blade Mixers. Some units with individual 30 HP motors, drives and screw tilts. Others with counter-weight tilts. Prices are cheaper than ever before—They All Must Go. Phone or wire for details. Perry Equipment Corp., 1429 N. 6th St., Phila. 22, Pa.

FOR SALE 5—Unused Baker Perkins size 15 JIM2, 100 gal. steam jacketed double arm Mixers; 1—Baker Perkins size 16 TRM, 150 gal double arm Mixer; 1—Ball & Jewell #1 Rotary Cutter; 1—Kent 6" x 14" three roll Mill; 6—Stokes Model DD2, DS3, D3 and B2 Rotary Preform Presses; 4—Stokes Model "R" single punch Preform Presses. Also: Sifters, Banbury Mixers, Powder Mixers, etc., partial listing; write for details; we purchase your surplus equipment. Brill Equipment Co., 2407 Third Ave., New York 51, N.Y.

FOR SALE—Reasonably priced to sell. Vacuum Form machine, less than a year old, Vac Trim fully equipped with plug assists. Complete with 5 aluminum molds for Flower Pots. AA-1 condition. Will demonstrate. Reply Box 5370, Modern Plastics.

FOR SALE: Baldwin-Southwark 200 ton semi-automatic transfer molding press. 2500 ton downstroke 54" 102". French Oil 250 ton 38" x 28". 200 ton hobbing press. 200 ton 16" record presses. French Oil 120 ton self-contained. W. S. 120 ton 24" x 24". Hydraulic pumps and accumulators. New ¾ oz. Bench Model Injection Machine. Van Dorn 1 and 2 ounce injection machines. Lester 16 oz. & Reed 22 oz. Other sizes to 100 oz. Baker-Perkins and Day jacketed mixers. Plastic Grinders. Oxford 57" slitter. Seco 6"x12" and 8"x16" mills and calenders. Hartig 3½" Plastic Extruder. MFM 2" & NRM 1" Plastic Extruders. Thropp 3" x 8" Lab. two roll Plastic Mill. Single & Rotary preform presses ½" to 4". Partial listing. We buy your surplus machinery. Stein Equipment Co., 107-8th St., Brooklyn 15, New York.

FOR SALE: Ovens, Grinders, Powder Mixers, Injection Molding Machines 1 oz. to 60 ozs. never used and used. Two-head Bottle Blowing Machine. Acme Machinery & Mfg. Co., Inc., 20 South Broadway, Yonkers, N.Y. YOnkers 5-0900, 102 Grove Street, Worcester, Mass. PLeasant 7-7747. 5222 W. North Ave., Chicago, Ill. TUxedo 9-1328.

FOR SALE: H.P.M. Rubber Injection molders, 21½"x28" mold space, steam heated platens. Watson-Stillman 300 ton semi-automatic compression molding press (1947) self-contained mold size 34"x27". Watson-Stillman 250 ton 28"x24". Watson-Stillman 140 ton 22"x16". Waterbury Farrel 85 ton 20"x24". W.F. 63 ton 15"x15". Laboratory presses—15 ton 10"x 8" and 10 ton 6"x6" platens. (2) 8 ounce Reed Prentice injection molding machines and (1) 8 ounce Lester Phoenix (late) with nylon attachment. Scrap cutters, valves, accumulators. Hydraulic Presses—all sizes. Aaron Machinery Co. Inc., 45 Crosby St., New York, N.Y. Tel.: WAlker 5-8300.

FOR SALE: Reed-Prentice 10 oz. injection molding machine. Model 10D12 Year 1951. No. bars—4, Dia. bars—3¼", space between bars (horizontal) 11¼, space between bars (vertical) 14¼, size of plate 21" (horizontal) x 25" (vertical), max. die height 16", min. die height 6½", stroke 13", 30 HP motor, Vickers pump, toggle type clamp. Very good condition. Call or write W. A. Kuschel, 2900 Niles Ave., St. Joseph, Mich. Phone YU-3-3768.

FOR SALE: 3 S.S. Centrifugals 40 in. bottom discharge & plow. Ball Mills. Baker Perkins 150 gal, 2 arm, 40 HP, S.S. Jacketed Vacuum Hydraulic tilt; 100 gal. 2 arm 50 HP. Stokes, 3 DDS2, 1 T. 2 DS3. Calenders. 3 Roll 45"x18 6 Roll 12"x5. 1000 ton Hobbing Press Powder Blenders. Hydr. Pumps. Motors. Machinecraft Corp., 800 Wilson Ave., Newark 5, New Jersey, Mi 2-7634.

LIQUIDATING PLASTIC - RUBBER CHEMICAL PLANT: Local Met. N.Y. Area. Farrell-Birm. Mills 60"-42" and 30" Rolls. Hvy Duty Jktd. Mixers Baker Perkins, Gavagnaro 150 gal., 200 gal., 300 gal. Hor. Hydraulic Sheeters. Multi Platen. Hydr. Presses. Cutter, Extruders, etc. Pilot plant installation. To arrange inspection phone: STerling 8-4672. First Machinery Corp., 209 Tenth St., Bklyn. 15, N.Y.

HIGH FREQUENCY HEAT GENERATORS: One Thermex 7 K.W., 19.1 meg's, grid size 14" x 20". One Thermex 15 K.W., 13.7 meg's, grid size 23" x 26". One Thermall 22 K.W., 70 meg's, grid size 41½" x 41½". All units complete and for operation on 220 volt, 60 cycle, 3 phase. Good condition. Standco Supply Co., 2701 Clinton Dr., Houston, Texas.

FOR SALE—Two sixteen ounce Watson-Stillman injection molding machines, 1954 and 1949 models. Both machines in excellent condition and may be seen operating. Continental Plastics Corp., 108 N. E. 48th Street, Oklahoma City, Oklahoma.

FOR SALE: Three (3) Injection Molding Machines— 1—8 oz. Reed 1950— 1—9 oz. HPM 1952—1 6 oz. HPM 1955. All excellent condition and can be seen in operation— Moonglow 959 Whittier St. Bx. N.Y.—KI-2-6100.

VACUUM FORMING EQUIPMENT: 1 Model 2-G-6 Double Head 48" x 72" molding area, 22" draw Formvac Model 'G' Series Automatic Deep Drawing and Forming Machine for molding rigid and soft thermoplastic sheet, completely equipped including infrared heater, electrical equipment and controls, automatic preset cycling for the heater which moves from side to side by electric motors, equipped with drape forming on both heads for extremely deep drawing, preset vacuum control, electricals for current 220 volt, 3 phase, 60 cycle. Actual usage—8 months. For complete information contact C. H. Strauss, Detroit Gasket & Mfg. Company, 12640 Burt Road, Detroit 23, Michigan, telephone KEnwood 1-3400.

FOR SALE: Vacuum Metalizer—Metal plated, Plastic, Metal, Glass, etc. Newest Stokes, Model #426 Vacuum. Complete with all Auxilliary Equipment. Push button operated. This machine used three months and can be purchased at a fraction of new cost. Stanford Pottery, Sebring, Ohio.

FOR SALE: 1 Laboratory set of Mixer, Roll Mill and Calender. Lab Hydraulic Press. Ribbon Mixer. Extruders: one 8", two 6", one 4". 1 BB Dough Mixer, one 2BB, one 60" 3 roll calender. Hydraulic Presses: one 24 x 24, one 18 x 18, one 16 x 16. 1 Large Vulcanizer. Synthetic Plastics Co., 88 St. Francis St., Newark, N. J.

Machinery wanted

WANTED BY MOLDER: Used injection molding machines, 8 oz. with preplasticizer, 12 oz. (HPM Preferred), Model VF822A Impco. Reply Box 5361, Modern Plastics.

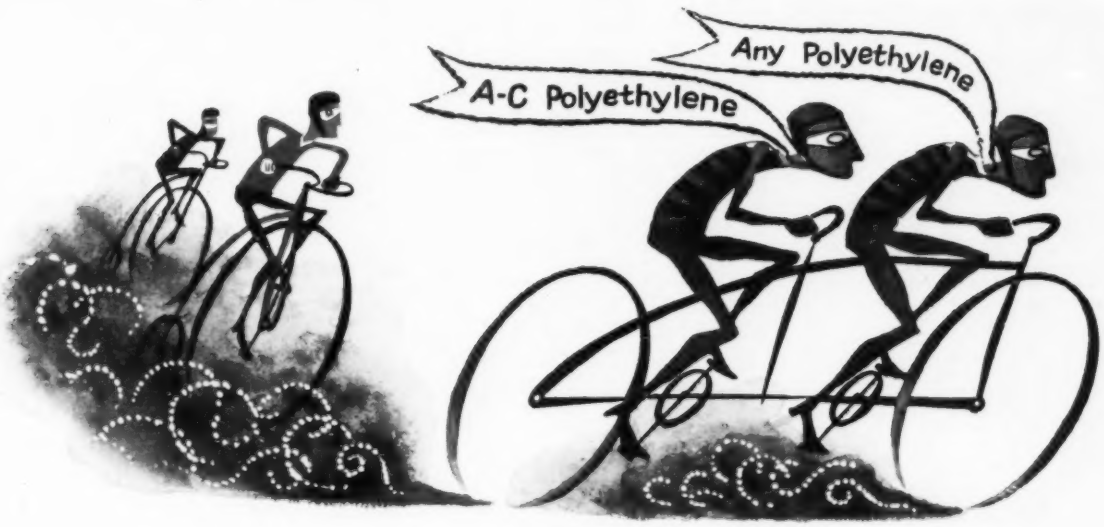
WANTED TO BUY: Used injection molding machines, oven, granulators. One machine or complete plant. Acme Machinery & Mfg. Co. Inc., 20 South Broadway, Yonkers, N.Y. YOnkers 5-0900, 102 Grove Street, Worcester, Mass., PLeasant 7-7747, 5222 West North St., Chicago, Illinois, TUxedo 9-1328.

MACHINERY WANTED: Good 2-3 ounce injection molding machine and accessories for test bars—1-inch extruder and accessories. State age, condition, and full particulars. Reed Plastics Corporation, 116 Gold Street, Worcester 8, Massachusetts.

PRESSES WANTED: Stokes type # E, F-4, T-4; Colton Type # 3DT. Send full particulars and price to Mansol Ceramics Company, 140 Little St., Belleville, N.J.

(*Continued on page* 232)

Blend Polyethylene with Polyethylene...



For Faster Cycles . . . Holding Low Temperature and Stress Crack Protection . . . Maintaining Quality Product . . .

blend with **A-C® Polyethylene**

See the difference for yourself! Blend A-C Polyethylene with your regular polyethylene resins, particularly the lower melt indices. Here's what happens!

You mold the same parts at lower injection pressures, using faster cycles. Stress crack resistance of low melt index polyethylene in blend is protected by A-C Polyethylene. Rejects caused by poor color dispersion are reduced. Melt index of blend is changed to a desirable, workable melt viscosity for easy mold filling. Mold sticking problems are eliminated—*even with mirror-finish molds.*

And, you can cut inventory requirements! By modifying the amount of added A-C Polyethylene you tailor the resin melt index to meet each individual molding problem. High melt index resins are no longer required. With a few conventional polyethylenes plus A-C Polyethylene you can now do the job that formerly required many grades. Production costs are lower, quality of molded parts higher, and you stock fewer grades of polyethylene.

No special equipment is required to take advantage of A-C Polyethylene. Just add to your resin during the color blending operation. Find out how A-C Polyethylene can produce better molded pieces at lower cost *for you!* Telephone or write your nearest Semet-Solvay Petrochemical office today for full information.

Allied Chemical

SEMET-SOLVAY PETROCHEMICAL DIVISION
Dept. 553-Y, 40 Rector Street, New York 6, N.Y.
National Distribution • Warehousing in Principal Cities

(*Continued from page* 230)

Materials for sale

REPROCESSED NYLON FOR SALE: Reprocessor offers highest quality pelletized nylon in all common resin types. Natural and black available from stock. Custom colors compounded on request. Samples and quotations promptly furnished. Adell Plastics Inc., 5208 Eleanora Avenue, Baltimore 15, Md.

Materials wanted

NYLON SCRAP WANTED: by reprocessor. All kinds including molding, extrusion and fabricating. Quotations promptly furnished on all grades and polymer types. Adell Plastics, Inc., 5208 Eleanora Ave., Baltimore 15, Md.

WANTED: Plastic of all kinds—virgin, reground, lumps, sheet and reject parts. Highest prices paid for Styrene, Polyethylene, Acetate, Nylon, Vinyl, etc. We can also supply virgin & reground materials at tremendous savings. Address your inquiries to: Gold-Mark Plastics Compounds, Inc., 4-05 26th Ave., Long Island City 2, N. Y. RAvenswood 1-0880.

WANTED: Vinyl and Polyethylene Scrap. Send description and small sample. We are continuous buyers. American Vinyl Corp., 73-30 Grand Ave., Maspeth 78, N.Y. Tel.: DEfender 5-9200.

WANTED: All types of plastic scrap and surplus inventories such as: styrenes, butyrates; acetates, acrylics and polyethylenes in any form. Write, Wire or Phone Collect. Humboldt 1811. Philip Shuman & Sons, 15-33 Goethe Street, Buffalo 6, New York.

URGENTLY NEEDED: Butyrate — Acrylic—Polyethylene Scrap. Claude P. Bamberger, Inc., One Mount Vernon Street, Ridgefield Park, N.J., Telephone: HUbbard 9-5330.

WANTED: We are interested in purchasing large quantities of clean reground or unground clear Plexiglass or Lucite, suitable for injection molding. Also large lots of clean reground and unground general purpose and impact Styrene. Reply Box 5368, Modern Plastics.

Help wanted

ORGANIC CHEMISTS: Our expanded film research program has created several challenging positions in basic polymer research. Applications are invited from Chemists at all degree levels. From 0-5 years experience in polymer or organic research desirable. Send resume and salary requirements to: E. R. Patterson, Olin Mathieson Chemical Corp., New Haven, Conn.

RESEARCH CHEMIST—PLASTICIZERS: Challenging position with leading manufacturer of industrial organic chemicals. Ph.D. or equivalent with minimum of 3 yrs. experience in plastics and plasticizers field. Experience in manufacture of plasticizers desirable. Excellent starting salary plus bonus participation and complete program of company-paid employee benefits. Send resume to—Personnel Dept., Emery Industries, Inc., 4200 Carew Tower, Cincinnati 2, Ohio.

SALES REPRESENTATIVES wanted by Custom Injection Molding Company. We are interested in men who are now calling on Industrial Accounts. Located in Midwest with modern and up-to-date facilities. Desirable territories open. Commission basis. Reply giving territory wanted to Box 5350, Modern Plastics.

PACKAGE DESIGN ENGINEER: Exciting opportunity for creative engineer with broad technological background in functional package and packaging machinery design. You will serve as consultant in all packaging areas of Eastern ethical pharmaceutical manufacturer. Salary open. Interviews will be arranged in Chicago during National Packaging Show. Write full personal particulars in complete confidence to Box 5372.

PLASTIC SHEET PRODUCTION ENGINEER: Minimum starting salary of $10,500 for energetic man completely experienced in setting up, training personnel and running plastic sheet department to produce quality high impact styrene sheet. Should be completely experienced in vacuum forming and die cutting operations. This is a key man position. Employee benefits. Bonus arrangement and stock ownership opportunities. Plant location—Florida. In reply, state past background and experience. All replies held confidential. Reply Box 5366, Modern Plastics.

PERSONNEL: Executive—Technical—Sale—Production. Employers and Applicants—whatever your requirements, choose the Leader in Personnel Placement. Cadillac Associates, Inc., Clem Easly—Consultant to Plastics Industry, 29 E. Madison St., Chicago, Ill.—Wabash 2-4800. Call, write or wire—in confidence.

WANTED: Mfgrs. Agent to handle territories Iowa, Indiana, Ohio & Kentucky—Triple A-1 firm has design, tooling and production facilities and know-how plus capacity. Interested in agents now selling non-competitive items and service. Commission basis, leads furnished, choice territories open. Reply Box 5342, Modern Plastics.

MANUFACTURERS REPRESENTATIVE: Top manufacturer of auxiliary equipment for plastic industry seeks representative for Ohio and Indiana. Concentrated coverage of plastic industry desired. Equipment well established in territory. Manufacturer provides effective support in promotion and service of equipment. Territory offers excellent potential. With reply please submit complete data to Box 5341, Modern Plastics.

HELP WANTED: Young progressive growth company needs experienced Plastics Product Development and Sales Engineer. Unsurpassed opportunity for right man with training in all aspects of plastic extrusions. Solution and paste resins knowledge and injection molding procedures, desirable, but not necessary. B.S. Chemical Engineering required. Sales training helpful. Must be willing to relocate. Excellent area with ideal year around climate. All replies held confidential. If qualified send full resume to Box 5340, Modern Plastics.

STAFF POSITIONS: A leading processor of thermoplastic materials has three challenging openings in: 1) Industrial Chemistry, 2) General Engineering, 3) Technical Sales. These are exceptional opportunities for personal advancement in a dynamic, young technical organization. Reed Plastics Corporation, 116 Gold Street, Worcester 8, Massachusetts.

PLASTICS ENGINEERS: Technical graduate, prefarably ME, experienced in plastics applications related to resin testing and evaluation, extrusion, injection molding and machine design for R & D assignments in expanding plastics group with Nylon-6 project. Challenging opportunity, complete benefit plans. Excellent working conditions. National Aniline Division, Allied Chemical Corporation, Hopewell, Virginia.

PLASTISOL CHEMIST: Established company in Mid Western Area has a supervisory position for a chemist with experience in custom compounding of plastisols for rotational, slush, and injection molding. Hospital, Life and Accident Insurance, Paid Vacations, plus Bonus. Salary commensurate with ability and potential. Send detailed resume and starting salary expected. Reply Box 5360, Modern Plastics.

TECHNICAL SERVICE — THERMOPLASTICS: Primary resin supplier in Southwest has excellent opening allowing a broad range of opportunity and responsibility including Customer Service, Production and Research Liaison for the Sales Department. Salary open. Responses kept confidential. Reply Box 5362, Modern Plastics.

MOLDING ROOM FOREMAN for day shift wanted by medium sized Chicago injection molder with Reed-Prentice equipment. Desire capable, aggressive individual experienced in sampling molds, establishing minimum cycles and know latest molding techniques. 5 yrs. injection molding experience required. Unusually good opportunity plus many Company benefits for right man. Reply Box 5364, Modern Plastics.

WANTED: Sales Engineer familiar with transfer and compression molding techniques. To sell and service accounts using electrical and electonic grade molding compounds. Territory to cover New York and New England areas. Salary plus incentive. Send personal resume and salary requirements. Reply Box 5367, Modern Plastics.

Situations wanted

SALESMAN-SALESMANAGER: 14 years experience custom molding. Specialized blue chip accounts. Background includes spray painting, vacuum plating, injection and extrusion especially in Nylon. Familiar with blow molding and injection molding machinery. Will re-locate. Reply Box 5359, Modern Plastics.

PLASTICS ENGINEER: M.E. Grad, 34, heavy custom-molding experience; compression and transfer molding specialist, but knows injection too. Unique molding plant background. Proven ability for establishing excellent customer relationships. Many other plus factors. Seeking Chief Engineer or equivalent staff position with future. Reply Box 5347, Modern Plastics.

MANAGEMENT ENGINEER with 11 yrs. solid shirtsleeve mfg. experience & expert knowledge of color compounding polyethylene, polypropylene & use of Banburys, extruders, roll mills. Also worked with reprocessing film, camel back & other types of scrap polyethylene, Styrene & vinyl plastics. Adept at problem analysis & cost reduction. B.S. Chem. Eng. + Bus. Adm. $12,000 min. Age 34. Reply Box 5354, Modern Plastics.

AGENT: Chemist, 9 yrs. technical sales. Establishing as Mfg. Agent in Pa., N.J., Del., Md., Va. Need lines molding, calendering, extrusion, resins, stabilizers, plasticizers, thermosetting resins, and specialty chemicals. Will warehouse. Reply Box 5346, Modern Plastics.

MANUFACTURERS REPRESENTATIVE: Selling electronics, industrial and utility companies in Virginia and N. Carolina desires one or two additional accounts. Manufacturer must have reputation for high quality. Top references and facilities. Reply P.O. Box 36, Ronanoke, Virginia.

FORMULATION AND PRODUCTION: Plastisols, Organosols and Vinyl solutions; 16 yrs. experience in automotive applications, cloth coating and dipping operations. Desire position with reasonable security in medium size or large company. Considerable experience purchasing and custom service work. Ability get along with people. Presently employed. Best references. Reply Box 5345, Modern Plastics.

JUNIOR MANAGEMENT: B.S. Age 36. Experienced in research, development, and technical service. Varied polymer background includes polyesters and epoxies. Capable organizer and idea man. Able to make decisions and delegate responsibility. Seeks position requiring an interest in science and management. Type of industry not important. Reply Box 5352, Modern Plastics.

INJECTION MOLDING—Plant manager, Superintendent, heavy experience in custom nylon molding, estimating, mold design, & sales engineering. Age 36, married, present location in midwest, will relocate. Reply Box 5343, Modern Plastics.

(*Continued on page* 234)

(*Continued from page 232*)

PLASTIC SUPERINTENDENT: Cost-minded, 20 yrs. experience, plant set-up, developing, design, tool room supervision, injection molding, compounding, sheet extruding and vacuum forming. Desires to locate with small or medium size company where his know-how can be fully utilized. Reply Box 5357, Modern Plastics.

PRODUCTION CONTROL MANAGER: 36, BS, MBA. 15 years experience includes shop work, production control, inventory control, purchasing, operations and cost analysis in the injection, rotational and blow molding fields, desirous of obtaining position that will enable the use of past experience and offer the opportunity to expand background. Reply Box 5355, Modern Plastics.

LAMINATION-DEVELOPMENT ENGINEER: Vinyl, mylar, paper, foams, etc. Excellent knowledge of fabrics, adhesives, coatings. Familiar with embossing, rotogravure printing and wipe shading. Highly creative and inventive with several patents. Also strong in costing, production and sales. Desires connection with aggressive firm. Reply Box 5344, Modern Plastics.

WANTED: Lines wanted Northern New Jersey-metropolitan New York. 4 man sales organization giving saturation coverage to rack, houseware, hardware, novelty, party-plan jobbers, drug, auto and variety chains. Maintain Fifth Avenue showrooms. Seek appropriate items. Reply Box 5369, Modern Plastics.

MANAGER-ENGINEER: Mechanical engineer, 39, P.E. Heavy supervisory experience in project engineering and development in chemicals and plastics. Recent position managing polyethylene film development and operations. Seeks demanding position with future for solid man with ability and drive. Reply Box 5365, Modern Plastics.

MANUFACTURER'S REPRESENTATIVE—Presently handling one line; can devote time and energy to additional established line in the Chicago area. Twenty years experience industrial and packaging fields; creative selling ability plus mechanical aptitude, combined with honest conscientious coverage and the will to work and build for future volume sales. Try me. Reply Box 5356, Modern Plastics.

Business opportunities

WANTED TO BUY: Small injection molding plant now in operation, preferably with some toolroom facilities. Reply Box 5363, Modern Plastics.

FOR SALE—Injection and compression mold making company employing 15 persons. Company is now in full production and profitable operation and has some small injection presses. Sell whole or part. Location Phila. area. Excellent opportunity to go into business. Will consider lease. Present owner will work on sales. Reply Box 5349, Modern Plastics.

WANTED TO BUY: Expanding injection molder would like to purchase going plastic injection molding plant in South Carolina, Georgia or Florida. Reply with full particulars to Box 5348, Modern Plastics.

Miscellaneous

FOR SALE: New Patented Shoe Shine Box. I am interested in selling patents on an outstanding new and recently patented (mechanical) shoe shine box which has big sales potential. Reply Box 5371, Modern Plastics.

OPPORTUNITY: Important Italian Manufacturing Firm of plastic products wishes to contact an established importer interested in a line of artificial plastic flowers of very accurate production. For further details write to Box 5351, Modern Plastics.

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THE MARK OF QUALITY

BARBER COLMAN

Wheelco Instruments

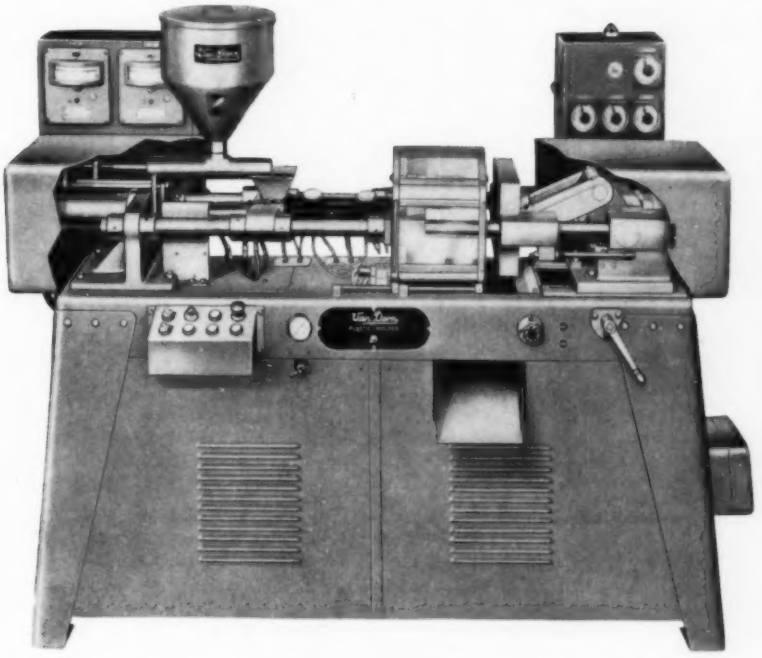
Wheelco temperature controls permit faster, more precise molding

Up to 720 molding cycles per hour on this Van Dorn machine — that's a production rate to put a burden on any temperature controller. What's the instrumentation specified? Wheelco 290 Series proportioning-type Capacitrols are selected to do the job.

A high-capacity heating chamber permits the machine to plasticize material at more than 30 pounds per hour, molding pieces up to 2½ ounces. Large platens accommodate 9" x 12" molds. Completely automatic operation and the larger, circular hopper with pilot light, permit operator to handle more than one machine.

Once again Wheelco is the choice of both the machine builder and user because both recognize the fact that all instrumentation just isn't the same. Experience with molding every type of material, trouble-free operation, and an unmatched field organization are some of the "extras" that win and keep friends for Wheelco.

Instrumentation training for your instrument technicians and supervisors conducted by specially qualified Wheelco instrument engineers is another service offered to the plastics industry. Your nearby Wheelco field engineer will be happy to supply more information.



Horizontal plastics injection molding press built by Van Dorn Iron Works Company, Cleveland, plasticizes at more than 30 lb per hour. Two Wheelco 290 Series Capacitrols maintain precise temperature control, aid fast cycling.

BARBER-COLMAN COMPANY

Dept. N, 1517 Rock Street, Rockford, Illinois, U.S.A.

BARBER-COLMAN of CANADA, Ltd., Dept. N, Toronto

INDEX OF ADVERTISERS

Distribution of this issue: 33,400 **March 1959**

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Plastics Problem?

Get help in a hurry from your Encyclopedia Issue!

EXAMPLE: ***Where and how to use resins and molding compounds?***

1. See the section "Resins and Molding Compounds" for all the fundamentals. Also see the materials charts and supplier lists in the "Technical Data" section.
2. Then check the Advertisers' Index—on the first page of the Resins . . ." section—for suppliers' ads on resins, coatings, emulsions, etc.
3. Secure additional names and addresses of suppliers from extensive Buyers' Directory lists in the back of the book.
4. Consult the Alphabetic Index for detailed cross-referenced listings of subjects related to your particular inquiry.
5. For more help, turn to the "Free Product Literature" section, select pertinent booklets and send for them with the enclosed free post cards.

EXAMPLE: ***How to color plastics?***

1. See the section "Chemicals for Plastics" for complete background.
2. Next, refer to the Advertisers' Index on the first page of the section for ads relating to your specific needs.
3. Check the Buyers' Directory for a detailed listing of suppliers of dyes, stabilizers, plasticizers, etc.
4. Consult the Alphabetic Index for detailed cross-referenced listings of subjects related to your particular inquiry.
5. For more help, turn to the "Free Product Literature" section, select pertinent booklets and send for them with the enclosed free post cards.

EXAMPLE: ***How to design a product—then get it made?***

1. Get the basic facts in the section "Engineering and Methods".
2. Then for molder and special service advertisements, see the Advertisers' Index on the section's first page.
3. Next, examine the Buyers' Directory for additional names and addresses of molders, extruders and service organizations.
4. Consult the Alphabetic Index for detailed cross-referenced listings of subjects related to your particular inquiry.
5. For more help, turn to the "Free Product Literature" section, select pertinent booklets and send for them with the enclosed free post cards.

EXAMPLE: ***Which machinery to buy?***

1. Turn to the section "Machinery and Equipment" for a complete picture of the factors involved.
2. Then see the Advertisers' Index on the first page of this section and select ads whose messages bear on your problem.
3. Get further information—names and addresses of machinery, machine tool and equipment manufacturers—in the time-saving Buyers' Directory.
4. Consult the Alphabetic Index for detailed cross-referenced listings of subjects related to your particular inquiry.
5. For more help, turn to the "Free Product Literature" section, select pertinent booklets and send for them with the enclosed free post cards.

The Encyclopedia is expressly designed to help you solve your problems. Reach for it next time you need help and see how valuable it can really be!

MODERN PLASTICS ENCYCLOPEDIA ISSUE

. . . for fast, accurate answers to plastics problems

(Continued from page 236)

MODERN PLASTICS

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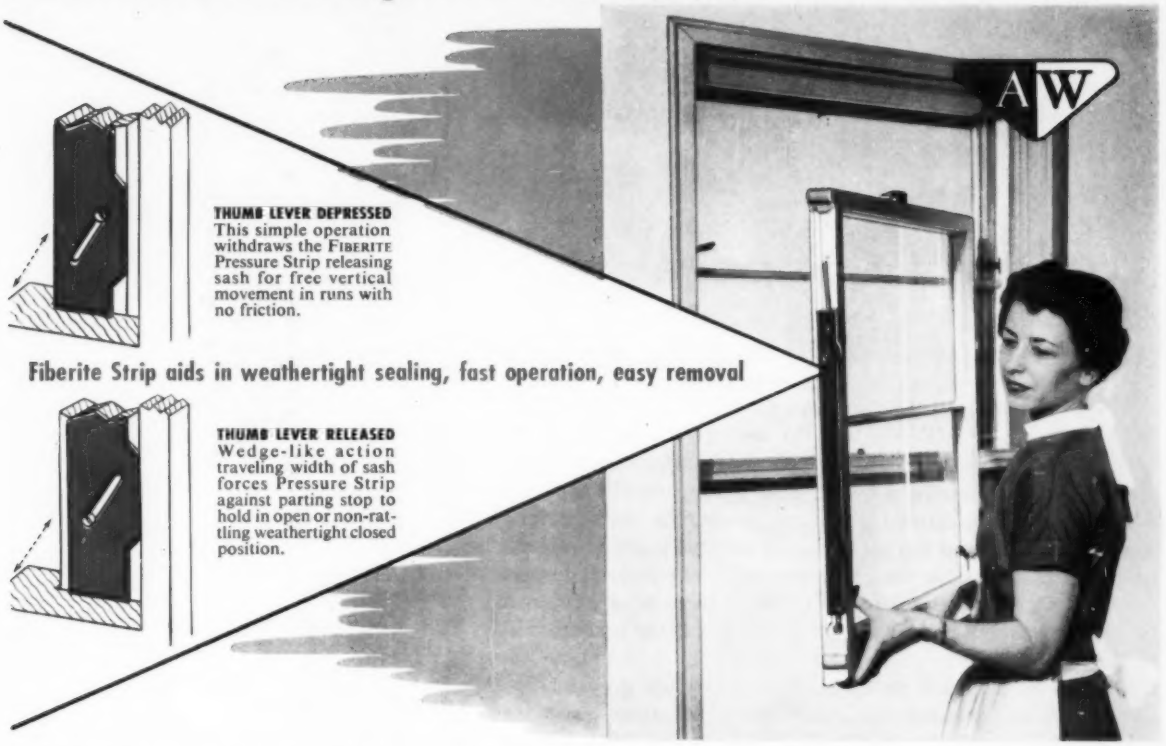
Another example of FIBERITE at work...



POPULAR ANDERSEN WINDOW *PRESSURE SEALS* WITH "1303"

"1303" is FIBERITE's phenolic nylon alloy. "1303" gives the wear and resiliency of nylon plus the highly desirable stability of phenolic.

The decision of the Andersen Corporation, world's largest window specialists, to make the above illustrated Pressure Strip of "1303" followed a year's critical study of over 70 different materials. Aluminum had previously been used but with unsatisfactory results. "1303" won the job because of its reliability and durability during countless "wedging" actions, giving it lifetime maintenance-free performance.

Let FIBERITE'S Phenolic Nylon take the shock for you!

FIBERITE "1303" has good impact resistance, low bulk factor for automatic molding, low *moisture* absorption, and excellent resiliency. Other typical applications include communication equipment housings, frames and grills, power mower hoods, gears, etc. Please tell us your problem. Improving your product is your only obligation!

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CHICAGO OFFICE: Railway Exchange Building, Michigan Ave. at Jackson Blvd., HA. 7-1164
WESTERN OFFICE: Riverdale Plastics, 8510 Warner Drive, Culver City, Calif., TE. 0-7733
CANADA: The Bakelite Co., 40 St. Clair Ave. E., Toronto 7, Ontario

PRODUCT DESIGNER AND MANUFACTURER: Andersen Corporation, Bayport, Minnesota
MOLDER: Kurz-Kasch Company, Dayton, Ohio
MOLDING COMPOUND: FIBERITE Phenolic Nylon No. 1303

THE FIBERITE CORPORATION
Manufacturers of Plastic Molding Compounds
Main Office: WINONA, MINNESOTA • Phone 2316

EDITORIAL

Too many papers

Technical conference literature in the plastics industries is rapidly becoming absurd in terms of quantity.

In the last week in January was the S.P.E. ANTEC, and in the first week in February was the annual conference of the R.P. Division of S.P.I. Both these conferences occasioned weighty and expensive preprint books, purportedly covering developments in plastics technology, processing methods, and design trends during the past year. A careful analysis of both preprint books leads to the conclusion that fully half the papers need never have been given; others might have been combined to present a composite picture of developments in certain subject areas.

There is the related problem that conference preprints do not in themselves constitute "permanent literature" because they are not indexed by all libraries, they are not abstracted by all abstract services, and only relatively few of the papers presented get into periodical publications which are so treated.

We have tremendous sympathy for the conference program and publications committees whose task it is to assess and edit the papers. These men do this work gratis, working evenings and week ends over many months, and get little thanks for it. Too often a paper as presented to a review committee will differ greatly from the submitted abstract on which acceptance was based. Too often the paper turns out to be a "plug" for a material, a method, or a machine. Too often a paper will be a rehash of progress of years past with the convenient addition of minor new developments as the excuse for its presentation.

We realize that in some cases a promotion or a raise for a technical man may depend on the presentation of papers. Just one more reason for the plethora of papers.

What have we to suggest? First, conference planning earlier than is now the practice; second, review committee study of submitted abstracts with a view to melding overlapping papers and elimination of redundancy; third, a much more vigorous screening and rejection process.

The first year such steps are taken some feelings are going to be hurt, but once the principle is established it should result in more interesting and more useful conferences, better and thinner preprint books, and more use of conference papers in the "permanent literature."

MAKE Pittsburgh Coke & Chemical your "one source" supply of phthalic, maleic and fumaric . . . and realize immediate savings in *time* and *money*. A single purchase order simplifies your paper work. Mixed carload shipments reduce transportation costs and permit tighter inventory control.

Buy "all three" from Pittsburgh Coke and you deal with *one* efficient, coordinated sales and service team, familiar with your operations and requirements.

But, most important of all, enjoy the confidence of doing business with a *basic* producer of uniform, high-purity materials, backed by alert, responsive sales and technical service. If your 1959 production calls for phthalic anhydride, maleic anhydride or fumaric acid, write to Pittsburgh Coke *today* for samples and specification sheets.

COAL CHEMICALS • PLASTICIZERS • PROTECTIVE COATINGS • ACTIVATED CARBON • CEMENT • COKE • PIG IRON • FERROMANGANESE

service is ALL in the day's work for G-E phenolics salesmen

The scene above was recreated for this photo, but it actually happened, not long ago, to the real-life people in the foreground—Fred Corbett (right), General Foreman of Prolon Plastics' Compression Department (Division of Pro-phy-lac-tic Brush Company), and G. E. salesman Don Smith.

Prolon, one of the nation's largest custom molders, was making a test run on a tight-specification part for an important customer. Two phenolic compounds had been tentatively selected for the job. One was a G-E phenolic, the other a competitor's. The pilot run was to determine the final choice.

Don Smith, passing through Florence, Mass. on his way home from the far side of his territory, stopped off as promised to see how things were going. It was well after five, but he was sure he'd find some of the production executives still around.

Sure enough, Fred Corbett was still in his office. The test run had gone well, but Fred wanted to build maximum quality and efficiency into the operation to meet the customer's and Prolon's exacting standards. Just routine. Fred and Prolon don't settle for "good enough." Neither does Don Smith. An hour, a cup of coffee, and several press adjustments later, their combined experience had found the answer. Smith was again on his way home.

Beyond the call of duty? Well, maybe. But Don Smith and his colleagues at G.E. wouldn't describe it like that. To them, and to the Technical Service staff in G.E.'s laboratories, helping molders solve problems is all in the day's work. In fact, it *is* the day's work.

For information about G-E phenolic compounds, or for technical help on a phenolic molding problem, call or write General Electric Co., Sec. MP 39, Chemical Materials Dept., Pittsfield, Mass.

Phenolics-first of the modern plastics ...first in value

GENERAL ELECTRIC